MACHINERY

DESIGN — CONSTRUCTION — OPERATION

Volume 36 JULY, 1930 Number 11

PRINCIPAL ARTICLES IN THIS NUMBER

What Goes Out in Your Waste Cans?—*By Charles O. Herb* 841
Manufacturing Circular Saws—*By J. E. Fenno* 849
Modern Grinding Methods in Railroad Shops—*By H. H. Moor* 854
Current Editorial Comment 858
Operating with a Reduced Force—Encouraging Suggestions—Records Must Serve a Purpose—Economy of Buying Standard Parts
Depreciation of Mechanical Equipment 859
The Manufacture of Thin-wall Tubing—*By William S. Lyhne* 860
Design of Automatic Die-casting Dies—*By Charles O. Herb* 865
Finishing Stainless Steel—*By Jack Pearsall* 870
Assembling 4440 Fittings Per Hour 873
Ingenious Mechanical Movements 876
Asking for Quotations on Machine Tools—*By G. Swahnberg* 887
Progressive Plants Modernize Equipment 889
Drilling Machine Operations on Austin Cylinder Blocks 890
New Applications of Tungsten-carbide Tools 892
The British Metal-working Industries 894
Foremen Meet in National Convention 895

DEPARTMENTS

The Shop Executive and His Job 848
Notes and Comment on Engineering Topics 857
Design of Tools and Fixtures 879
Ideas for the Shop and Drafting-room 884
Questions and Answers 886
New Shop Equipment 897

Total Distribution for June, 17,031 Copies

Product Index 280-302 Advertisers Index 305-306

PUBLISHED MONTHLY BY

THE INDUSTRIAL PRESS, 140-148 LAFAYETTE STREET, NEW YORK

LONDON: 52 Chancery Lane PARIS: 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, $3 (two years, $5); foreign countries, $6. Single copies, 35 cents.

Changes in address must be received fifteen days before they are to be made on our mailing list. Please send old, as well as new, address.

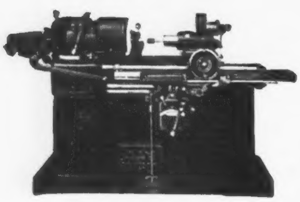
NOW! Is The Time To Replace Your Obsolete Grinding Machines

PRODUCTION is below normal . . . work schedules are light . . . the pressure on your organization and equipment is reduced . . . NOW is the time to study your plant — department by department — and replace obsolete and inadequate equipment with modern up-to-date machines capable of giving maximum results.

The Heald line of Internal and Surface Grinding Machines is complete from a simple hand operated machine to an automatic on which the operator has only to chuck the work and throw the starting lever. Practically any internal or surface grinding job can be handled on one of the numerous Heald Machines.

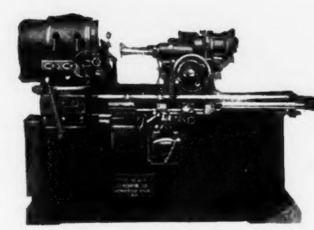
Our Service Engineers will gladly study your problems and submit recommendations to you without obligation.

The Heald Machine Co.
Worcester, Mass., U. S. A.



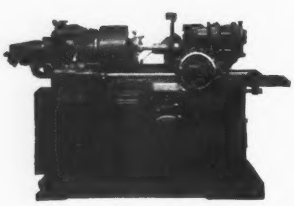
Plain Internals

For tool rooms, the production of miscellaneous work and for small shops.



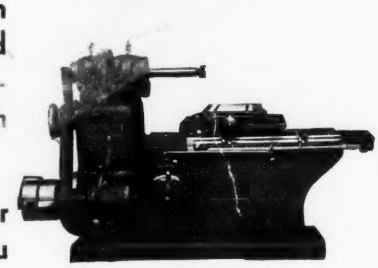
Airplane Cylinder Internals

For single airplane cylinders and large sleeves.



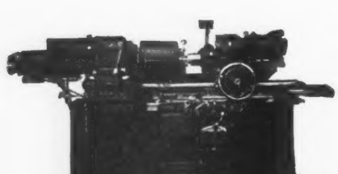
Size-Matic Internals

Automatic, for a variety of work. (Not limited by character of hole.)



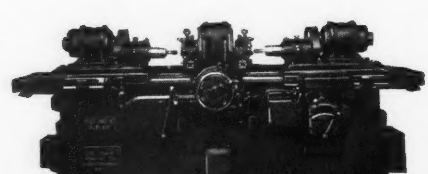
Cylinder Grinders

For large awkward shaped work which cannot be rotated.



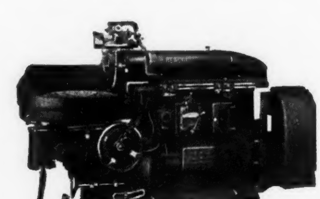
Gage-Matic Internals

Automatic, for straight open holes to close limits.



Size-Matic Duplex Internals

For sizing opposed holes in perfect alignment simultaneously.



Surface Grinders

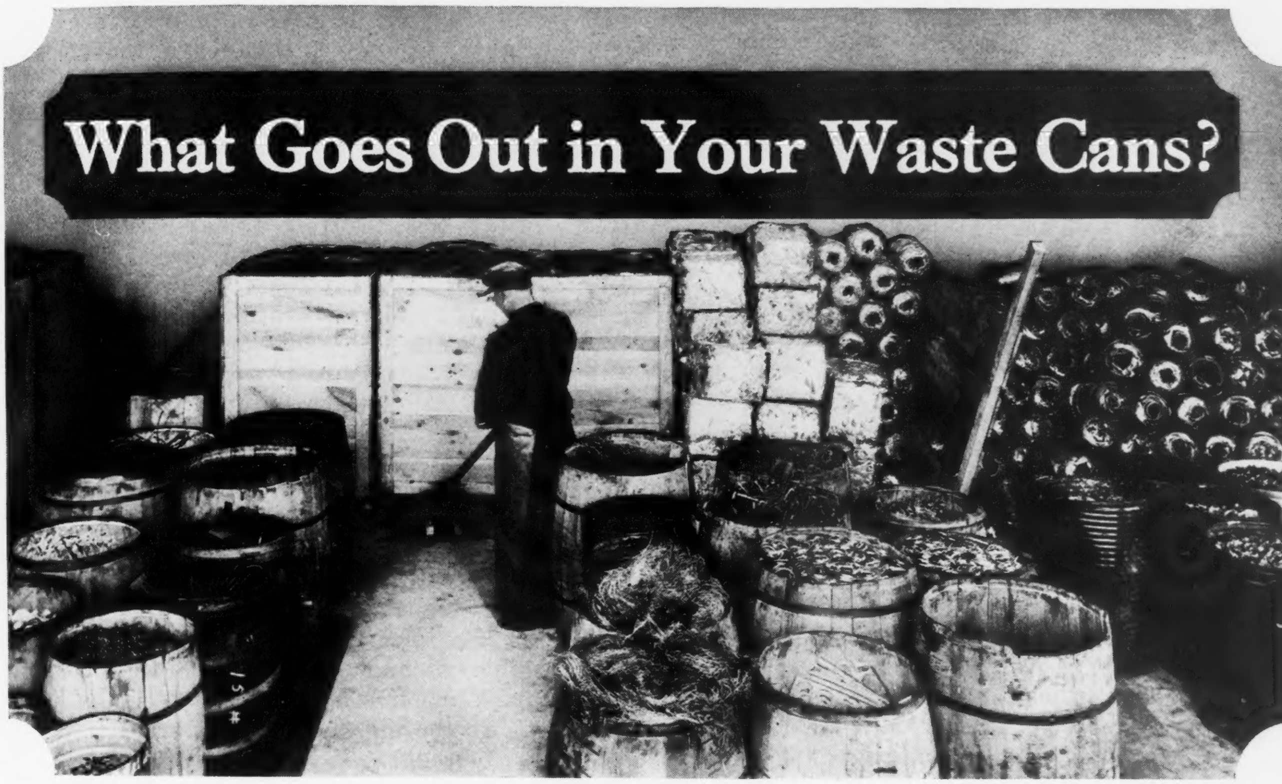
For tool rooms, and for large awkward shapes or small multiple pieces.

HEALD

MACHINERY

Volume 36 NEW YORK, JULY, 1930 Number 11

What Goes Out in Your Waste Cans?



Careful Consideration of All Scrap and Waste with a View to Possible Reclamation or Sale Pays Good Returns to the A C Spark Plug Co.

By CHARLES O. HERB

THOUSANDS of dollars are lost annually by the average fair-sized industrial plant because of inadequate consideration of the disposal of scrap and waste. Unless careful attention is given to this problem, things of value to the concern constantly find their way into the waste cans.

At the plant of the A C Spark Plug Co., Flint, Mich., all kinds of waste and scrap are thought of as by-products and are closely scrutinized by the "By-products" department, with a view to disposing of them with maximum profit to the company. This department has paid large returns by reclaiming or selling many articles that were previously thrown away, by securing higher prices for metal chips and scrap through careful segregation of the different metal compositions, and by preventing the throwing away of spoiled work without the knowledge of the executives.

This by-products department is installed in a separate sheet-metal building, interior views of which are shown in the heading and in Fig. 2. The building is 90 feet long by 30 feet wide, and was erected at a cost of approximately $10,000. It has paid for itself by providing a place for the storage of non-ferrous scrap in large quantities, so that it can be disposed of in carload lots, as well as a place for accumulating and sorting other kinds of scrap; by eliminating the services of two men; and by facilitating cleanliness of the department. There is a large yard adjacent to this building for the storage of boxes, barrels, and kindling wood.

Nothing is Thrown Away without the Knowledge of the By-products Department

Practically all scrap or waste, with the exception of steel turnings, borings, and chips, eventually reaches the by-products building, as the foremen have been thoroughly imbued with the fact that they will be held responsible if articles of any possible value are thrown away. Separate cans are provided in the different manufacturing departments for rags, paper, metal scrap, etc. Even floor sweepings from the manufacturing departments are accumulated and sent to the by-products department to be sorted and sold for their metal content. The income from these sweepings alone ranges from $40 to $50 a month. Periodically, the head of the by-products department makes visits to the rubbish dumps with the motor trucks to make certain that instructions are being complied with.

All steel turnings, borings, and chips produced by lathes, automatic screw machines, and

other machine tools are transported in electric trucks to a large bin in the building where such machines are installed. This bin extends from the floor of the basement to the ceiling. The chips are dumped into this bin by means of a turnover device installed in the floor above.

Two centrifugal type oil reclaiming machines are installed in the basement, adjacent to the bin, as shown in Fig. 4. The metal turnings and borings pass out of the bin through a chute, as illustrated at the left, into big metal baskets, which are then lifted by a jib crane into either one of the two machines. After the oil has been extracted, the baskets of turnings are again lifted by the crane and dumped on a conveyor, which may be seen in the background of Fig. 4. This conveyor carries the turnings over a shaker device through which the smaller chips fall and are conveyed to an overhead bin having a chute down which they slide into gondola cars. The longer turnings fall to the floor and are shoveled into a pile. These are sold in truckload lots, as the quantity is not enough to warrant holding them for carload lots or using a crusher to reduce the size. Bar ends and parts of the product that have become mixed in with the turnings at the machines are separated at this point. The bar ends are sent to a steel bin and the parts to the salvage department for inspection.

It has been found desirable to separate the short chips from the long turnings in this manner in order to obtain the best prices From 35 to 40 tons of chips and turnings are handled per day with this equipment. The brass turnings and borings are "whipped" for oil in the same manner, and held until a sufficient quantity has accumulated for carload shipments.

The oil reclaimed from the turnings is piped to filter equipment and used over and over again at a big saving, about 600 gallons of oil being filtered per day. If the oil were not extracted from the chips and turnings, a certain percentage would be deducted from the weight of each carload to allow for moisture.

Fig. 1. Means Employed to Impress Employes with the Difference in Value between Good and Spoiled Work


Fig. 2. Interior View of the By-products Building to which All Scrap and Waste is Sent for Reclamation or Sale

Salvage Committee Authorizes Sending Parts to By-products Department

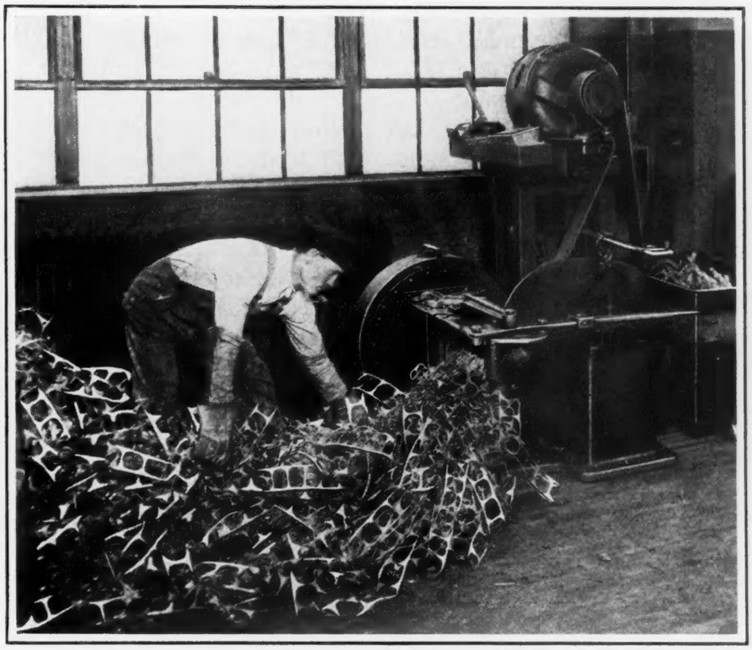


Fig. 3. Rolling Skeleton Scrap Compactly into Small Bales for Convenient Handling

Skeleton scrap from punch presses, worn-out gloves, dirty rags, burned-out electric light bulbs, paper, etc., are delivered to the by-products department as a matter of course, but defective work, obsolete jigs or fixtures, worn-out tools, and similar articles are not accepted by that department unless authorized by a salvage committee. This committee is composed of the manufacturing superintendent, the chief inspector, a representative of the engineering department, the master mechanic, or one of his assistants, the metallurgist and the head of the by-products department. Weekly meetings are held in each of the two plants of the concern to look over all spoiled work and other parts, which are collected in pans between the meetings.

Spoiled or defective work is carefully examined with a view to deciding upon means for preventing similar recurrences and also finding some use for the parts. Actual visualization of the parts in these meetings has been found to stimulate ideas for making use of them. One of the principal results of the salvage committee meetings has been an appreciable reduction in the amount of spoiled work, since carelessness in any department cannot occur without the knowledge of the plant executives.

The salvage committee finds it necessary to decide upon many different problems. For instance, it may happen that bolts and nuts of a given size have become obsolete for a certain job, and the salvage committee finds itself obliged to decide whether they can be employed elsewhere or whether they should be recommended for sale. Raw material, such as bar stock, sheet brass, or steel, must often be disposed of in the same manner. All broken tools such as drills, taps, milling cutters, hacksaws,

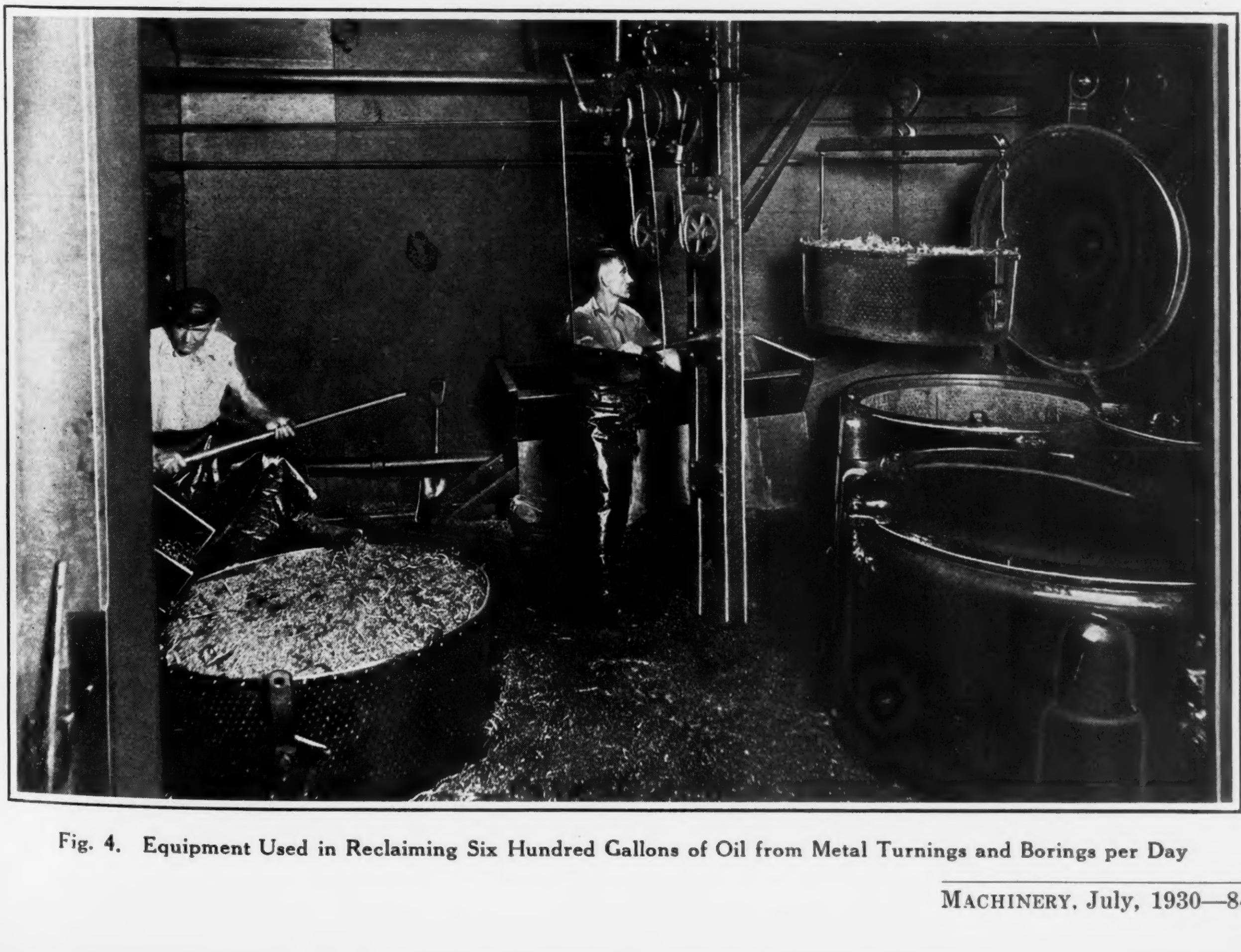


Fig. 4. Equipment Used in Reclaiming Six Hundred Gallons of Oil from Metal Turnings and Borings per Day

and files are brought to the attention of the salvage committee, the tools from each department being kept separate so that the superintendent can trace excessive tool breakage. There are also some tools that can no longer be used in one department, but that can be salvaged for use in another department.

Notes are taken of all decisions made by the salvage committee, and typewritten instructions in accordance with the findings are issued to all persons concerned. For example, if some parts have failed to pass inspection because of a minor defect, a certain foreman may be notified to make suitable corrections. Also, the by-products department is advised in this manner of all parts to be sent to him. Occasionally, when a large quantity of parts has been spoiled through negligence, a barrel of the parts is tagged as illustrated in Fig. 1, to impress on the minds of the employes the great difference in value between good work and scrap.

It Pays to Keep Different Metal Compositions Separated

Not only is the scrap of all different metals, such as steel, cast iron, brass, and aluminum, kept separate, but also each different composition of non-ferrous metal, high-speed and carbon steels, etc. That this practice pays big dividends is illustrated by the fact that the revenue from about the same amount of scrap for four months of 1929, in comparison with similar months of 1928 when the scrap was handled more or less haphazardly, amounted to about $89,000 instead of $56,000, or an increase of $33,000. On an annual basis, the increased revenue from careful segregation of the different compositions is about $100,000.

The highest prices for scrap can be realized only by keeping in close touch with market conditions and then obtaining competitive bids. Such bids are most easily secured by offering clean scrap of known compositions. All pans of scrap sent to the by-products department are carefully watched to see that the metals are not mixed. When this happens, the foreman of the department responsible for the carelessness is notified at once. Ferrous scrap that has become mixed with non-ferrous scrap is separated by a hand magnet.

Segregation of the scrap is facilitated in the by-products department by having individual boxes and barrels for the various classifications of non-ferrous metals. Boxes of the type seen along the wall in the heading illustration, are received at the plant filled with certain supplies. They are 4 feet long by 3 feet wide by 4 feet high and make excellent receptacles for brass clippings and trimmings, each box holding from 1 1/2 to 2 tons of such scrap.

Fig. 5. Pressing Steel Power Press Scrap of Various Kinds into Bales to Reduce the Bulk and Facilitate Shipment

These boxes are placed on skids and can thus be easily trucked on board freight cars for shipment. Two men have loaded thirty tons of metal in such boxes within three hours, whereas when such scrap was loaded from bins to a motor truck and then unloaded in a freight car, it took four or five men 2 1/2 days to load a similar tonnage. When the boxes of scrap reach their destination, the customer can unload them as quickly as they were loaded.

At the right in the heading illustration is seen a heap of rolled brass skeleton scrap and immediately beside it are piles of rolled and baled aluminum skeleton scrap. The rolls are about 10 inches in diameter by 15 inches long, and weigh from 50 to 70 pounds. They are formed by means of the machine illustrated in Fig. 3, which is installed in the

power press department. The bales are pressed together by the equipment shown in Fig. 5, which is in a small building adjacent to the by-products building. All steel skeleton scrap is also baled with this equipment and stored on the outside of the by-products building, as this kind of scrap accumulates in large quantities and must be shipped frequently. From $4 to $5 more per ton can be obtained for baled than for loose steel scrap. The bales measure 16 by 12 by 10 inches and weigh approximately 220 pounds. Altogether, about forty different classifications of metal scrap are handled in this way.

All boxes or barrels in good condition are used for the storage of scrap or else sold. Those that are broken so that they cannot be repaired readily are knocked apart and used as kindling wood.

Rags supplied to the machine operators for wiping their hands and cleaning their machines cost 11 or 12 cents per pound. It has been found that these cloths can be washed as many as four or five times, and this has resulted in annual savings amounting to $5000 or more. Waste cans are closely watched to see that no rags are carried away as rubbish.

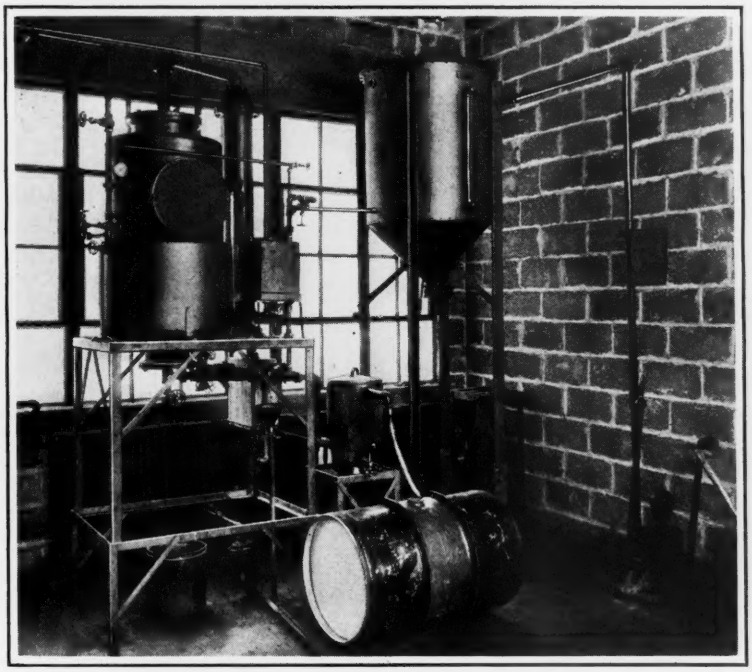


Fig. 6. Distilling Equipment Installed in a Small Separate Building for Reclaiming Paint Thinner and Several Other Liquids

On certain jobs, canvas gloves are furnished to the machine operators. As the men apply to the storekeepers for new gloves, the old ones must be returned, and these are sent to the by-products building where they are inspected periodically to make certain that gloves that are merely oily or greasy are not being thrown away. When too many gloves that could still be used reach this department, the foremen and superintendent are notified. This practice has effectively stopped a considerable leakage. Oily or greasy gloves are washed and used over again, while worn-out gloves are sold as rags.

Chamois cloths are used in various departments, a month's supply of new cloths costing about $425. These cloths were formerly thrown away when they became soiled, but the by-products man learned that they could be washed and used several times. This is now done at a saving of about $300 a month. Burlap is graded into two classes and sold.

Used-up Buffing Wheels are Sold to Other Concerns

Buffing or polishing wheels are not accepted by the by-products department until they have been worn down to a diameter of 6 inches, whereas they were previously discarded when reduced to 8 or 10 inches in diameter. This increased use has been made possible by speeding up the spindles of buffing lathes and has resulted in a saving of $100 per month, or $1200 a year. The sections of the buffing wheels are separated in the by-products building and sold to other companies as hand pads for lifting hot articles, holding pieces of work against buffing wheels, and for various other purposes. Approximately $30 a month is realized from this source alone.

Cakes of Tripoli composition used on polishing wheels were formerly thrown away when they became too short to hold conveniently with the fingers. Now these stub ends are saved and remelted in molds to form large cakes, at a saving of $30 a week or $1500 a year.

Goggles and Oil-cans are Repaired

Broken or dirty goggles are repaired at an average cost of 40 cents. New lenses and screws are purchased and kept on hand for this purpose, while earpieces are transferred from worthless goggles to those that can still be used, but that require different earpieces.

Oil-cans reach the by-products department with spouts broken or missing, bodies dented or leaking, etc. The good parts of these cans are retained for use on other oil-cans that may be satisfactory except for such parts. When the bodies merely have small holes that cause leakage, the holes are soldered and the cans returned to the store-room.

Ratchet screwdrivers at the rate of about 100 per month are sent back to the manufacturers to be repaired at an average cost of 25 cents.

Lead Hammers are Recast and Files Resharpened

Lead hammers, greatly pounded out of shape, reach the by-products department. They are melted in the electric furnace shown in Fig. 7 and recast in molds. The handles, of course, can be used over and over again. Lead is also reclaimed from various parts; for instance, the lead centers from used-up emery wheels are sent to this furnace to be melted.

Solder dippings are remelted and cast into bars, and the dross is sold, about $200 being realized per month from that source. The furnace has a capa-

city for 500 pounds of solder per melt. Aluminum and zinc dross from the die-casting machines is sold to refining companies. About one ton of aluminum dross and fifteen tons of zinc dross accumulate per month.

All files 6 inches or more in length are sorted according to type and size and wrapped in oiled paper. When a sufficient quantity has accumulated, these files are sent to another concern to be resharpened. Savings resulting from the practice of resharpening files range from $450 to $500 per month. The files are resharpened two or three times.

Nozzles of spray guns are brazed shut when the openings become too large and are then redrilled to the desired size. The cost of redrilling is 2 cents as against an original cost of 35 cents. About twenty of these nozzles are repaired per week.

Many Good Electric Light Bulbs are Saved

All electric light bulbs turned in to the various tool-cribs throughout the plants are sent to the by-products building and are tested by screwing them into an electric socket in the wall. At first, the number of good bulbs thrown away through carelessness was considerable, eight dozen being salvaged in one month.

At first thought, it would seem impossible that so many good bulbs could be turned back into the tool-cribs, but a plausible explanation can be given. For instance, when an operator turns on the switch of the light fixture at his machine, if the bulb fails to light, he usually assumes that it is burned out, takes it to the tool-crib, and obtains a new light in its place. The old bulb may have failed to light because it was loose in its socket or a short circuit may have existed. The attendant at the tool-crib generally puts the old bulb in the scrap pan without trying it out. When too many good bulbs are received in the by-products department, the foremen of the departments from which they come are advised.

Tool Steels are Separated by Spark-testing

Worn-out cutting tools are submitted to a spark test on the emery wheel of a bench grinder to determine whether they are made of high-speed steel or carbon steel. These steels are then kept in separate boxes, since the high-speed steel scrap is usually worth about 20 cents a pound, whereas a mixture of high-speed and carbon steel scrap brings only about 6 cents a pound. As an average of 500 pounds of high-speed steel scrap accumulates per month, it is obviously worth while to take this precaution.

Savings are Realized by Returning Certain Parts to the Manufacturers for Repair

On various parts, such as burned-out armatures of portable electric drills and damaged ball or roller bearings, considerable savings can sometimes be made by returning them to the manufacturer for repairs. Dental burrs used in fine metal-working operations are sent back to the manufacturer to be resharpened at a cost of 20 cents each, whereas the cost of these burrs when new is $1 apiece. A two-months accumulation of these burrs is resharpened at a saving of almost $200.

Fig. 7. Electric Furnace Used for Remelting Lead Hammers and Reclaiming Lead and Solder from Various Parts

Most Paper is Salvaged

Certain cartons in which supplies are received from other concerns are kept clean and returned to those companies for a substantial allowance. Oiled paper sheets, such as are used in the bottoms of stock pans throughout the plants, cost 2 cents apiece. These sheets, when soiled, were formerly taken to the rubbish dump by the thousands and burned. They are now cleaned by means of a filler at a saving of 1 cent apiece. In one month, 24,000 of these sheets were returned to the store-room for use.

Clean cardboard is saved to be placed under products to be shipped. All other scrap paper that is clean, such as newspaper, is baled and sold. In this way, practically all paper that has served its purpose is salvaged at a profit. Eighteen tons of paper are baled per month.

Distilling Equipment has been Installed for Reclaiming Various Liquids

Two barrels of a thinner used for stripping paint from parts that fail to pass inspection are required daily. This thinner costs about 75 cents a gallon and was previously thrown away after it had been used. Upon investigation, the head of the by-products department decided that this thinner could be reclaimed. Consequently, a small concrete building was erected to house the distilling equipment illustrated in Fig. 6. Now 90 per cent of the thinner is reclaimed at a cost of 2 cents a gallon, which results in a saving of approximately $500 per

month. The building and equipment cost about $3000. Gasoline, naphtha, seal oil, etc., are also distilled with this equipment.

Not Everything can be Reclaimed or Disposed of for Money

Obviously, some kinds of scrap and waste reach the by-products department that are not valuable enough to have time and labor expended on them. The head of the department is the judge as to whether a thing can be reclaimed at a fair return. For instance, if pieces of aluminum and zinc scrap become mixed, he must decide whether it would pay to separate these pieces by hand. Six men, besides the supervisor, are usually engaged in baling and loading scrap and paper, in sorting the various articles, and in carrying on other activities of the department.

Whenever the head of the by-products department finds an outlet for any of the accumulations in the building, he notifies the purchasing department, which handles all the selling details. Competitive bids are solicited for all metal scrap and turnings, as previously mentioned, in order to insure sales that are fair to all concerned. This has been found to give much higher returns than when business was done with only one junk dealer.

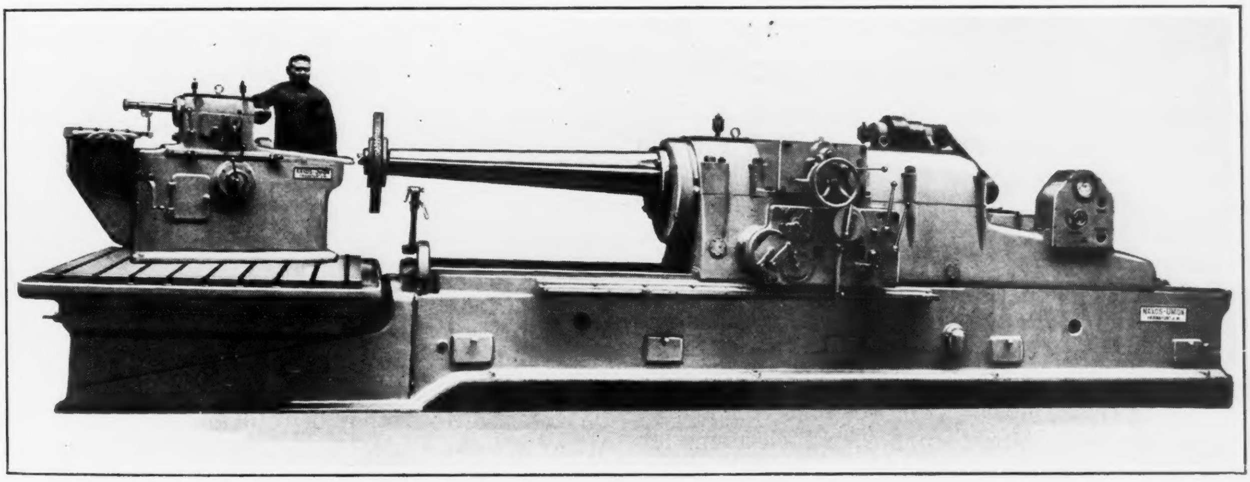
Cooperation of All Departments is Essential to Complete Success

The head of the by-products department spends a great deal of time in visiting all manufacturing departments of the plant and endeavoring to win the confidence of the foremen. His job consists of getting value for articles that have given full service to the company, but it also consists of striving to reduce the amount of unnecessary scrap and waste delivered to him. He must depend on others to help him, and unless the full cooperation of the foremen is obtained, entire success in the problem of scrap and waste disposal cannot be realized. Success in this work also depends largely upon the alertness of the by-products man in finding new uses for the things received by this department.

PLANETARY TYPE GRINDER FOR LARGE CYLINDERS

By S. WEIL, Chief Engineer, Schiess-Defries, A. G., Dusseldorf, Germany

The automatic internal grinding machine shown in the accompanying illustration was built recently by the Naxos-Union, Frankfort a/Main, Germany, for grinding cylinders from 12 inches in diameter by 30 inches long up to 3 feet 3 1/2 inches in diameter by 7 feet 2 1/2 inches long. It is especially intended for work that cannot be revolved but must remain stationary while grinding. In order to give some idea of the size of this machine, a grinding machine of the same type, but of the size used for grinding automobile engine cylinders, is shown on the table of the larger machine. The smaller machine weighs 2 tons, and the larger machine weighs 34 tons.



Thirty-four Ton Planetary Type Cylinder Grinder

The planetary head can be adjusted while running, either by hand or automatically, within its maximum rotation diameter of 12 inches. It has six speeds ranging from 7 to 30 revolutions per minute, and can be stopped without interfering with other running parts of the machine. A rapid change in the amount of eccentricity of the planetary member, such as is required in changing from a large size to a smaller size bore, is obtained by means of a separate 3-horsepower motor. A 40-horsepower motor located at the rear of the headstock drives the spindle, the carriage, and the planetary member. The grinding spindle has six speeds ranging from 600 to 1600 revolutions per minute. The radial feed of the wheel is actuated at each reversal of the longitudinal movement of the carriage, either by hand or automatically.

* * *

Four large 3000-horsepower electric locomotives for use on passenger trains on the electrified division of the Great Northern Railway through its eight-mile tunnel under the Cascades have been ordered from the General Electric Co. The new locomotives weigh approximately 530,000 pounds.

The Shop Executive and His Job

Superintendents and Foremen are Invited to Exchange Ideas on Problems of Shop Management and Employe Relations

BONUS FOR BEGINNING WORK ON TIME

I agree with the view expressed in the article "Bonus for Beginning Work on Time," on page 601 of April MACHINERY, that a promptness bonus is particularly advantageous in insuring prompt attendance throughout the factory; but there is another point that I would like to emphasize. The payment of such bonuses amounts to a duplication of payment. It is an employe's job to be at the factory on all working days and to be there promptly —that is part of what he is paid for. Therefore, a promptness bonus should be unnecessary. Tardiness adds to production costs and hurts the employe as well as the employer. HARRY KAUFMAN

DISTRUST PRESENT METHODS

Commenting upon the article "Distrust Present Methods" in May MACHINERY, page 689, I would like especially to point out that it is possible to use even the best and most up-to-date modern equipment inefficiently, if the right size of machine is not selected for the work.

In many shops I have noted that the machines used are too big for the work being done. Apparently large machines have been bought with the idea that they would accommodate any work that came along. The result is that a very expensive machine is regularly used on light work for which a smaller and cheaper machine of the same general design could be employed. Interest and depreciation must be earned on expensive equipment, when less costly equipment would perform the work equally well—it being understood, of course, that this less expensive equipment is equally modern, only of smaller size. Unusually large work can often be sublet to advantage to another shop that has larger equipment. MANUFACTURER

WHAT A FOREMAN SHOULD KNOW ABOUT COSTS

Some people say that the foreman need not know costs. The writer has found from experience, however, that unless the foreman has some idea of what it costs to operate his department, he cannot be expected to know when and how to effect savings. A knowledge of shop expenses creates a desire to economize.

The foreman who is given information about costs is no longer merely a gang boss, but rather a partner in managing the shop. He begins to understand his relation to the business as a whole and his responsibility for the careful use of money. He is in the best position to observe and detect weaknesses in methods and to recommend constructive changes, because he is nearest to the work being done. His chief duty is to get work done with such speed and accuracy that a product of the required quality can be turned out at a reasonable cost.

In his supervision of the care and operation of the machine equipment in his department, the foreman can do much to reduce expenses. When he has a knowledge of the cost of the equipment, he will have a better understanding of his responsibility. He will cooperate to the best advantage with the repair department to save expense and avoid interruption of operation by having equipment repaired before complete breakdowns take place.

A. H. RODRICK

DISCUSSION ON SHOP RULES INVITED

At the present time, I am interested in the subject of shop rules. I realize that some of the larger corporations have very specific rules for every department, but what I have in mind is a set of rules that would be more general in its application. For example, I would like to know what the customary rule and policy is in regard to allowing men to quit ahead of time for the purpose of washing up, and if they are paid for the time so spent. Then, again, the subject of tardiness is one on which it would be valuable to exchange information and opinion. What are the customary penalties for tardiness in different plants? How is tardiness prevented and how is punctuality encouraged? I would like superintendents and foremen to suggest what methods they have found most successful. MANAGER

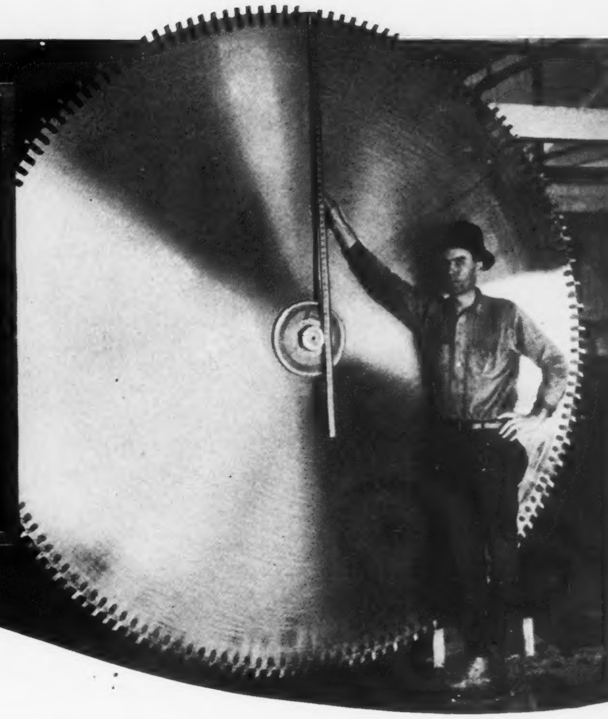
INTRODUCING THE NEW MAN TO THE SHOP

First impressions count in every walk of life. The employment manager, after having interviewed an applicant and hired him, should immediately introduce him to the foreman of the department where he is to work and let the foreman acquaint him with the equipment with which he will work. The new man will then start working with a different feeling, having some acquaintance with the job. Thus he will be made to feel at home and will be more likely to stay on the job. The piece-worker especially is anxious to know that the equipment with which he is to work is in good condition, and a preliminary acquaintance with the shop may settle any doubt that may exist in his mind. The new man may also be encouraged to tell something about his past experience and the types of machines used for similar work in other shops where he has been employed.

MORTON SCHWAM

Manufacturing Circular Saws

By J. E. FENNO



Methods Used in the Production of Solid and Inserted-tooth Circular Saws up to 130 Inches in Diameter—Second of Two Articles

IN the first installment of this article, published in June MACHINERY, the methods used by the Simonds Saw and Steel Co., Fitchburg, Mass., in making solid-tooth saws were illustrated and described up to the point of the fitting of the teeth. The term "fitting" in saw making, applied to solid-tooth saws, refers to the setting or swaging and filing of the teeth. As the term implies, the saw is "fit" for use after these operations have been performed. The object in setting or swaging teeth is to provide clearance for the body of the saw in the kerf, while the filing operation produces sharp cutting edges on the teeth.

In setting a saw, the teeth are bent one to the right and the other to the left with a hand tool slotted to fit the tooth. Bent in this way, the teeth will cut a kerf wider than the saw body, thus providing the necessary clearance.

Filing the Teeth to Provide Keen Cutting Edges

After the saw is set, the tooth faces are filed to produce keen cutting edges. When the saws are large, or when the quantity in the lot is small, the teeth are filed by hand in a fixture in which the saw is clamped close to the tooth being filed, but when a large number of saws are to be filed, the work is done in the machine shown in Fig. 7. Here a saw is shown mounted on an arbor. This arbor can be adjusted vertically to suit the diameter of the saw being filed. Two three-cornered files operate automatically; one files the face of every other tooth, while the other files the intermediate teeth.

Many saws are made with the faces of their adjacent teeth filed at opposite angles. By using the two filing heads *A*, which can be set at an angle, it is possible to file every tooth in one revolution of the saw. With a machine provided with but one head, it would be possible to file only every other tooth, after which the saw would have to be reversed on the arbor in order to finish the remaining teeth.

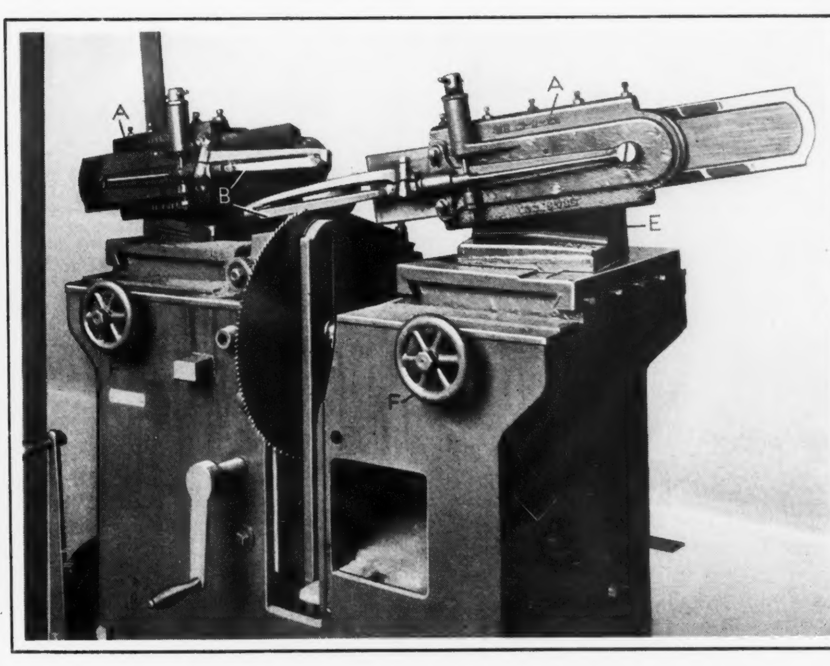


Fig. 7. Machine for Filing the Teeth in One Revolution of the Saw

The files *B*, secured to the heads, cut only when the heads are traveling away from the saw. Upon the completion of the cutting stroke, the file is raised from

the tooth and held in the raised position during the return stroke, at the end of which it descends on the next tooth to be filed.

The files can be adjusted to correspond with the pitch of the saw teeth by turning handwheels *F*, which moves the bases *E* parallel to the sides of the saw. The saw is indexed automatically two teeth after each head has completed a cutting stroke, by means of a pawl which engages the saw teeth. The pawl is pivoted at the end of a lever attached to a shaft at the rear of the machine, and is operated by means of a cam driven from the main drive shaft.

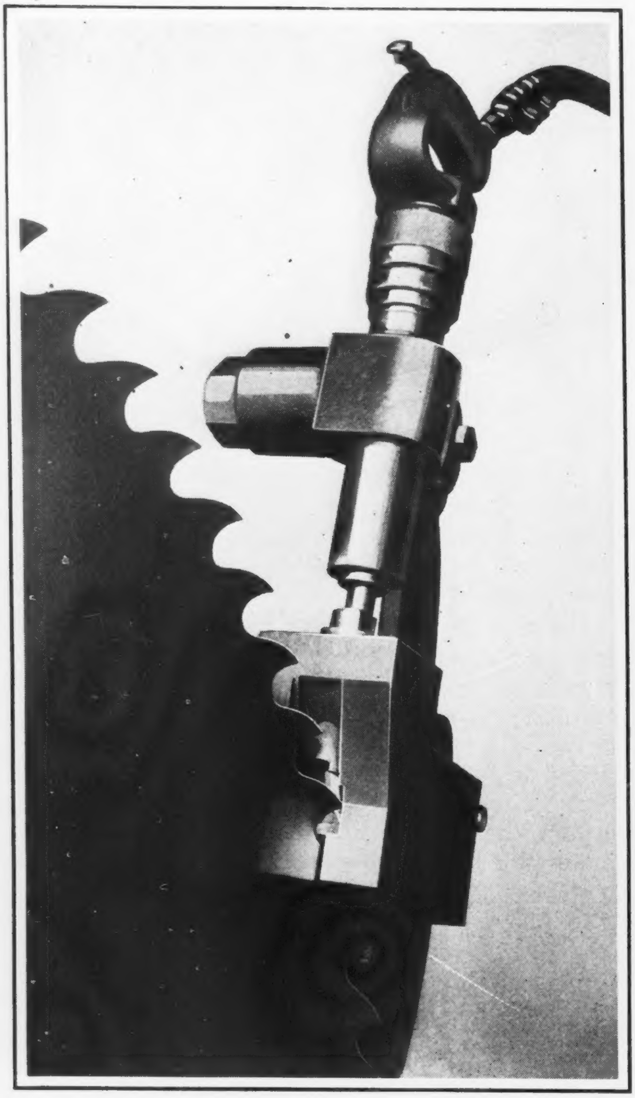


Fig. 8. An Air Hammer is Used to Spread or Swage the Tooth Points

Swaging Saw Teeth for Clearance

Saw tooth clearance can also be obtained by swaging. This is done, as shown in Fig. 8, by means of an air hammer attached to a counterweighted arm which oscillates about a stud in a cast-iron pedestal at the rear of the saw. The saw is indexed by hand and revolves on an arbor secured to the pedestal. To swage a tooth, the arm is swung toward the saw until the face of one tooth rests on a hardened anvil under the swaging punch. The operator then depresses the valve lever in the handle of the hammer, causing the punch to strike the tooth. The swaging punch is so designed that when its heel comes in contact with the top of the anvil the swaging of the tooth is completed.

The air hammer is then swung back and the saw is indexed to the next tooth. The teeth are afterward ground or filed on their faces as well as on the top to remove the fins resulting from the swaging operation.

Fig. 9. The Vee Projections in the Gullets are Milled with an Eccentric Cutter-head

Milling Gullets for Inserted Teeth

Milling the circular vee projections around the gullets in inserted-tooth rip saws is done as shown in Fig. 9. This operation is performed on a special machine in which the "veeing" cutter *A* rotates in an eccentric head *B*. Only the cutter and the end of the head can be seen in the illustration.

The saw is centered on an arbor fastened to the end of the machine, with the upper part of the gullet resting against a stop *C*. Strap *D*, attached to the machine, is then clamped against the saw.

The operator now feeds the cutter into the gullet, milling the short curved vee that supports the tooth. This operation is repeated on all the gullets, after which the portion that fits the shank is milled.

The gullets in the other types of inserted-tooth saws are milled on a similar machine, except that the feed of the cutter is straight instead of circular. Great accuracy must be maintained in milling these gullets, as the teeth and shanks must fit the saw tightly.

Assembling Inserted-tooth Saws

To insert the teeth, the saw plate is mounted on an arbor in a cast-iron pedestal. The shank is started into the gullet first, and is followed by the tooth. A wrench from which a pin protrudes that engages the hole in the shank is used for assembling the shanks and teeth. The pin, entering the hole in the shank, acts as a driver, revolving both shank and tooth into the gullet.

Forging the Inserted Teeth

The manufacture of the different styles of teeth and shanks used in inserted-tooth saws involves the use of a great deal of special equipment. A few of the most interesting operations performed on teeth for rip saws will be described.

The rip-saw tooth shown at *C* in Fig. 1 of the first article is forged from a long rod of rectangular cross-section in the drop press shown in Fig. 10. The ends of a number of these rods are first put into a gas furnace located close to the press. The operator removes one of the heated rods and inserts it between the two revolving wire brushes *A* at the rear of the press to remove the scale. He then lays the heated end on the die and trips the press.

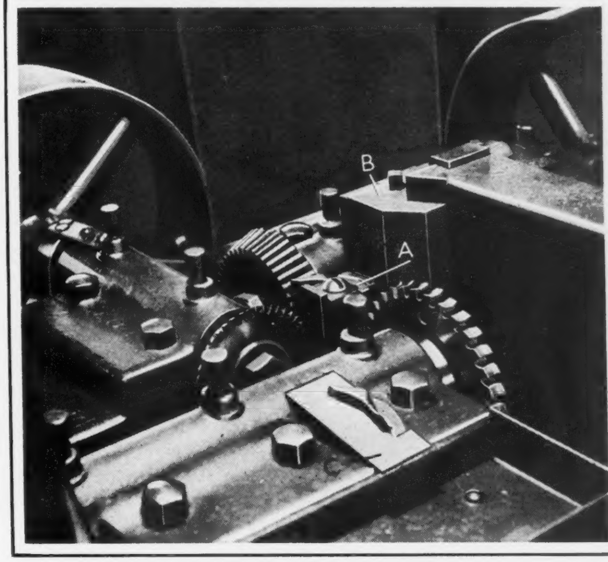


Fig. 11. In This Machine the Face, Top Clearance, and Heel of the Tooth are Milled Simultaneously

After the tooth is forged, it is cut from the end of the rod with the shear *B*, operated by a foot-treadle. The thin fin projecting all around the tooth is removed in a shaving die in a power press.

Milling Three Tooth Surfaces Simultaneously

The face, top clearance, and heel of the tooth are milled at one time in the machine shown in Fig. 11. The tooth is clamped on the block *A*, attached to the vertical slide *B*. This slide is fed downward by means of a cam located in the machine base, carrying the tooth past the three cutters. After the cut is completed, the slide returns the tooth rapidly to the starting position, where it is removed and another tooth clamped in its place. Each cutter-spindle is driven independently by a belt from a countershaft.

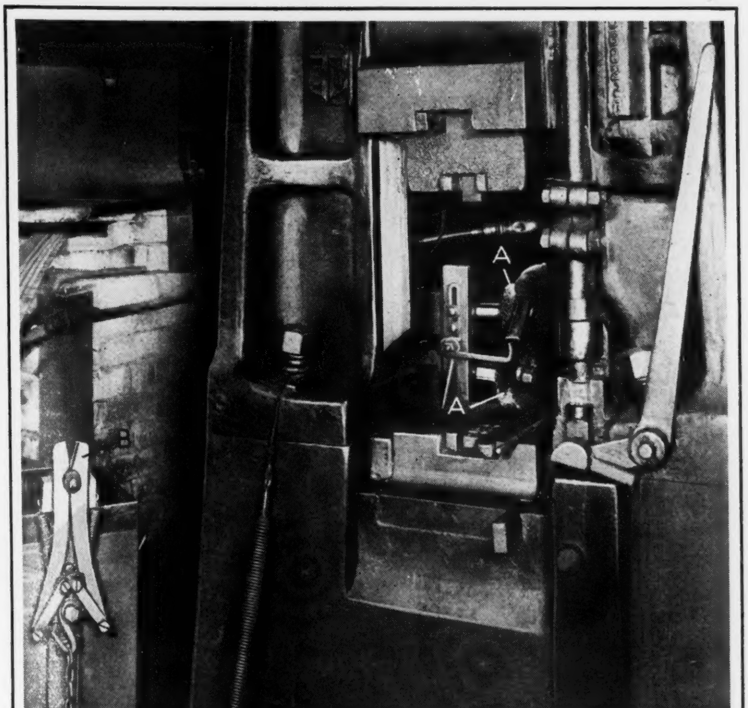


Fig. 10. The Teeth are Forged at the End of Rods Heated at the Press

The cutter-heads are dovetailed to the machine base, and can be adjusted so that the cutters will mill to the proper depth. The gage *C* is used for checking the accuracy of the milled surfaces on the teeth. These machines are arranged in batteries. One man operates six machines and mills 5000 teeth in a nine-hour day.

Milling the V-groove in the Teeth

The V-groove in the back of the tooth is milled in the machine shown in Fig. 13. For this operation, the tooth is clamped between the two members of the holder *A* by the star-wheel *B*. Cam lever *D* is then pushed down, engaging the worm and worm-gear, which imparts a rotary motion to the holder. As the holder revolves, the tooth is fed past the cutter.

On the completion of one revolution of the holder, the tooth again reaches the loading position. The cam lever *D* is then raised, throwing the worm and worm-gear out of engagement. The tooth

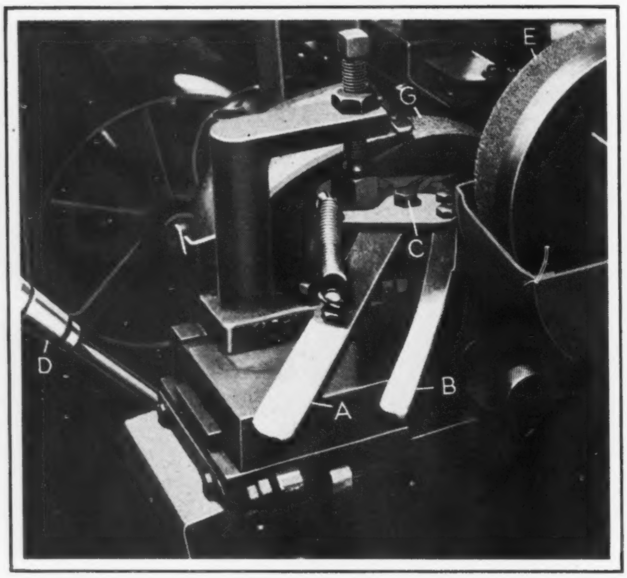


Fig. 12. In This Machine the Tooth is Swung Rapidly to Two Positions to Grind the Face and Top Clearance

is now removed and replaced by another tooth, after which the operation is repeated. These machines are arranged in batteries, one man operating six machines and milling 5000 teeth in nine hours. The bead of the tooth is next milled in a standard milling machine with a form cutter.

Hardening and Tempering the Teeth in an Automatic Furnace

The teeth are hardened in the automatic cylindrical gas furnace shown in Fig. 14. Several hundred of the teeth are poured into the rear end of this furnace. From this point they are fed slowly through the entire length of the furnace by means of a screw conveyor which is fastened to a shaft and driven by means of a train of gears from the motor *A*. The screw conveyor is revolved at such a speed as to keep each tooth in the furnace fifteen minutes. A sight-hole is provided at *F* so that the operator can inspect the teeth as they pass through the furnace. Two pyrometers, one connected to each end of the furnace, are used to check the uniformity of the heat.

When the teeth have reached the end of the conveyor, they drop down through an opening in the end of the furnace into the tank *B* which is filled with oil. This tank is 11 feet deep, the greater part being sunk into the ground. An endless conveyor chain *C* running on the double sprocket wheel *D* passes down into this tank. As this sprocket wheel is secured to the end of the shaft driving the screw conveyor, both wheel and conveyor revolve at the same speed.

After the teeth are ejected from the furnace, they drop on the inner side of the conveyor chain loop at the bottom of the tank. Each link of the chain is equipped with a pocket, so that as the chain moves, these pockets collect the teeth and carry them slowly up through the oil. Thus when they reach the surface, they are fully quenched. As the pockets pass over the sprocket they are tilted, allowing the teeth to drop down the chute *E* into the portable container *G*.

The teeth are next tempered in a rotary furnace, similar to a conical tumbling barrel. The rotary action permits a uniform temper to be obtained.

Sharpening the Teeth

The tops and faces of the teeth are next ground in the machine shown in Fig. 12. A tooth is clamped in the swivel arm *A* by a finger operated by the lever *B*. The arm *A* swivels on a stud *C*, the length of arc through which it swings being controlled by stop-screws. This arrangement allows the tooth to be swung quickly to two positions. In the position shown, the fixture slide is moved forward by lever *D* to grind the face of the tooth on the wheel *E*. The slide is then moved back against a stop and the operator swings the arm *A* to the right, carrying tooth against the grinding wheel *G*, where the top clearance is ground.

The clearance on both sides of the tooth is then ground in another machine. For this operation, the tooth is held in a fixture, while two grinding wheels, taking a plunge cut, grind both sides simultaneously.

* * *

According to the annual report of the Secretary of Commerce for 1929, there are at the present time nearly 30,000 miles of air routes over which scheduled service is being maintained. Mails to the extent of about 6,000,000 pounds are now being carried by the air service.

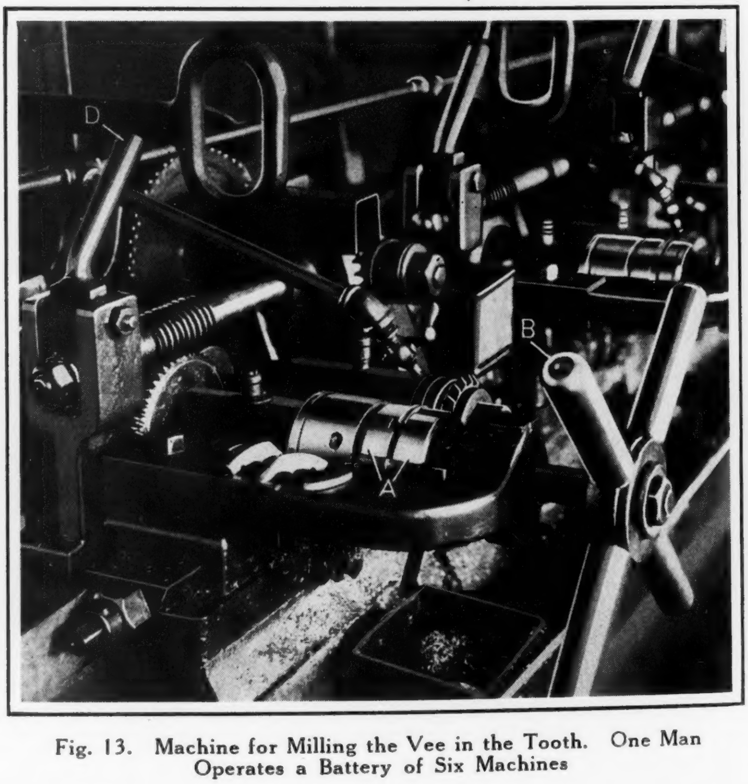


Fig. 13. Machine for Milling the Vee in the Tooth. One Man Operates a Battery of Six Machines

BENCH DESIGNING

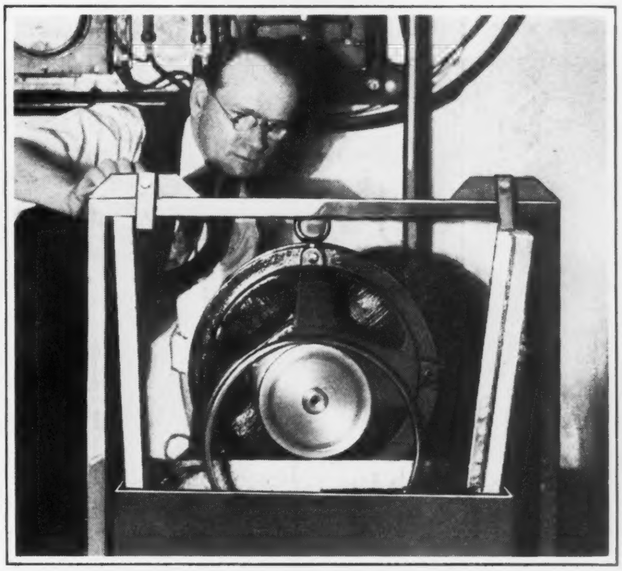
By EDWARD HELLER

A great deal has been written in MACHINERY at different times about bench designing. Some writers think of bench designing as a sort of sacrilege, while others believe it is a much desired feature in machine and tool building. As a matter of fact, the truth probably lies between the two extremes, and bench designing has a place somewhere.

First let us analyze the conditions and see when the average shop resorts to bench designing. It goes without saying that no manufacturer of machine tools, for example, will let his patternmaker design the castings or his machinists design the spindles or gears. Those are jobs that must begin on paper.

Bench designing is resorted to most frequently in the manufacture of small special tools, jigs, fixtures, and above all, in the making of dies. It is done in most cases because of lack of time. When time does not permit the job to go through the process of a careful lay-out and of detailing, the tool designer will probably consult with a patternmaker and get him started on patterns, or with a toolmaker and get him started on some of the steel parts; but in all cases the designer will be close to those working at the bench, and thus will prevent any serious mistakes. This process may waste some material and run up the cost of the job in general, but it will save considerable time, if that is an important factor.

Another case when bench designing is resorted to is when there are no available drafting-room designers. This can best be illustrated by a recent personal experience. A new line of work in sheet metal was to be tooled up. The job consisted of dies of various kinds. The intention was to hire a number of tool designers and do the job in the usual way. More than a week's search revealed a great many tool designers but hardly one good die designer; and in the search, over a week of the time allotted for making and designing the tools was lost. Bench designing, therefore, had to be resorted to, and it saved the day.



An Oil-ring Testing Machine, Used in the Research Laboratories of the Westinghouse Electric & Mfg. Co. to Determine the Most Effective Size, Shape, and Weight of Oil-rings for Maximum Lubrication

A crew of intelligent diemakers was given a chance on the job, and in a short time, dies were beginning to move from the tool-room to the press room. True, a few pieces of tool steel were scrapped—some because they proved to be too short, others because they were too thin, and in one case, an expensive die set had to be thrown out because, after the die was mounted, there was no room left for gages; but all in all, the whole job went through just about as well as if it had been designed on the board.

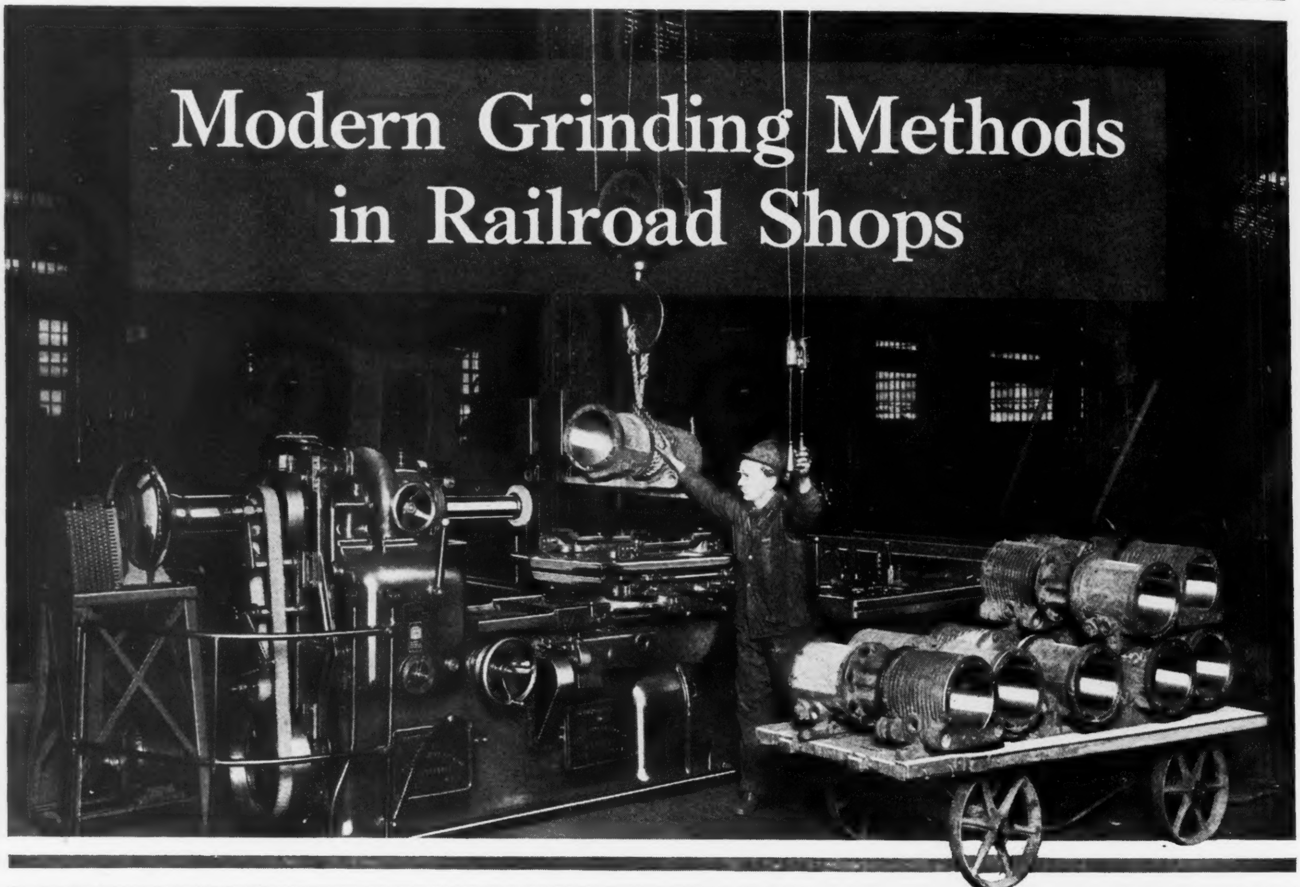
Oh, yes, there is one bad feature about bench designing. There is no record of the dies or tools, but that can be remedied after the rush is over.

* * *

The United States Civil Service Commission announces a competitive examination for chief engineering aeronautic draftsman. Applications should be filed with the Civil Service Commission at Washington, D. C., not later than July 9. Information may be obtained from the U. S. Civil Service Commission, Washington, D. C., or from the Civil Service Board of Examiners at any Post Office.

Fig. 14. The Soft Teeth are Fed in at the Rear of This Furnace and Delivered at the Front End Glass Hard and Cold

Modern Grinding Methods in Railroad Shops



Second of Three Articles Dealing with Applications of Grinding in the Finishing of Cylinders, Holes, and Bores in Locomotive Parts

By H. H. MOOR, Micro Machine Co., Bettendorf, Iowa

IN the first article of this series, published in June MACHINERY, the application of the internal grinding machines built by the Micro Machine Co. to the grinding of air pump cylinders, reverse gear cylinders, bushing holes in side and main rods, and valve motion parts was illustrated and described. The present article will deal with the grinding of fire-door cylinders, throttle valves, links, and link-blocks.

The Grinding of Fire-door Cylinders

By accurately grinding the bores of fire-door cylinders, it is possible to obtain a close fit for the pistons, resulting in a minimum of wear and high

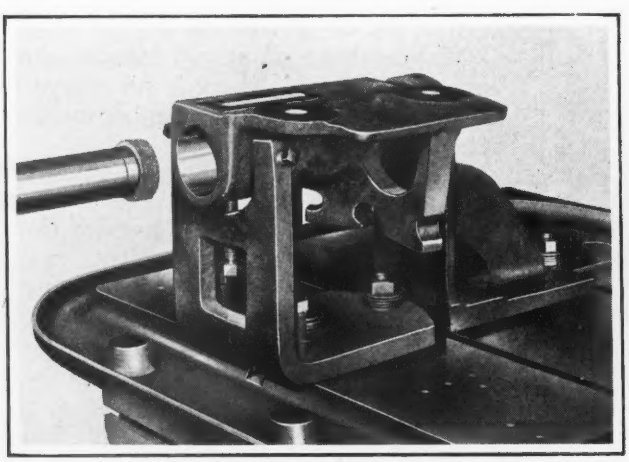


Fig. 15. Grinding a Butterfly Fire-door Cylinder

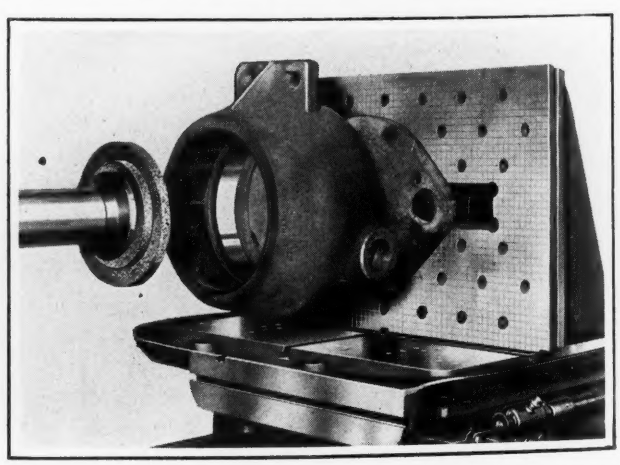


Fig. 16. Grinding a Chambers Throttle Valve

operating efficiency. Fig. 15 shows a fixture designed for holding the Franklin butterfly fire-door cylinders while grinding. A quick set-up and rapid production are made possible by the use of this fixture, which is shown without the fire-door cylinder in place in Fig. 17.

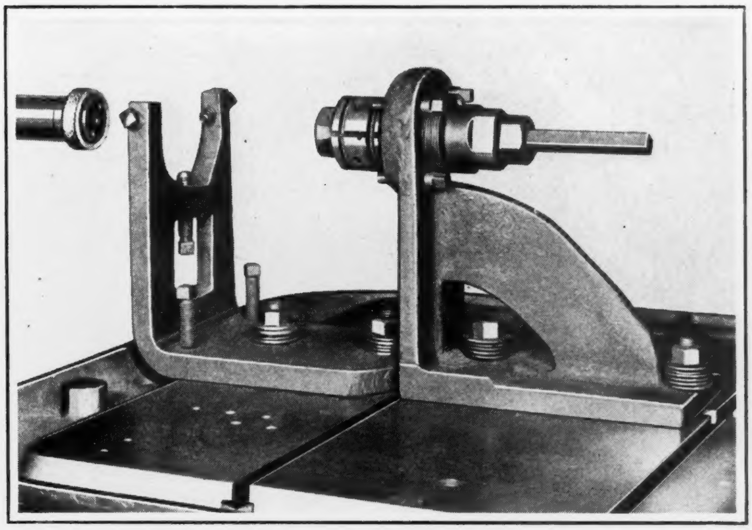


Fig. 17. Fixture Used for Grinding Fire-door Cylinders, with Rapid-action Centering Device

As may be seen in this illustration, the locating plug is of an expanding design. This plug is removed after centering the rear end of the cylinder, ready for grinding. Before the expanding arbor is removed, however, the four square-head cap-screws draw the cylinder securely against the fixture face. The end of the cylinder toward the grinding spindle may be adjusted sidewise and up and down by means of three set-screws. Very satisfactory results have been obtained by the use of this fixture in a midwestern railroad shop.

The Grinding of Throttle Valves, Bell Ringer Cylinders, and Valve Chest Bushings

Fig. 16 shows a Chambers throttle valve set up for grinding. The grinding process is exceptionally advantageous for refinishing parts of this kind, because many more overhaulings are possible and the danger of steam leakage is greatly reduced. Railroads using this method have reported that unusually satisfactory results have been obtained.

Fig. 18 shows the set-up used for grinding a bell-ringer cylinder. The V-type angle-plate is employed for convenience. It is designed, however, especially for the grinding of bushings, and can be used conveniently for setting up such work as main valve bushings for cross compound pumps, as illustrated in Fig. 19.

Valve chest bushings can be effectively ground with a set-up such as shown in Fig. 21. The pressure of the grinding wheel over the port openings is comparatively slight, which is an important advantage. The many applications of the angle platen should be noted. It is adapted to many types of mountings. The heads of the bolts that clamp the work are sunk into slots on the rear side of the platen to prevent them from turning when clamped.

Link Radius Grinding Attachment

A grinding attachment for link grinding is illustrated in Fig. 20. This attachment is placed directly on the swivel table of the Micro grinding machine, and is located by keys in the center T-slots of the table. Radii ranging from 20 to 100 inches can be quickly and accurately ground either in the link or on the link-blocks. Fig. 20 illustrates the set-up for a Walschaert link. A scale is provided for setting this device to the radius required, as shown in Fig. 22. A sensitive vertical adjustment furnishes means for feeding the grinding wheel to the work. The wheel is dressed with the diamond held in a bracket attached to the platen on which the work is supported.

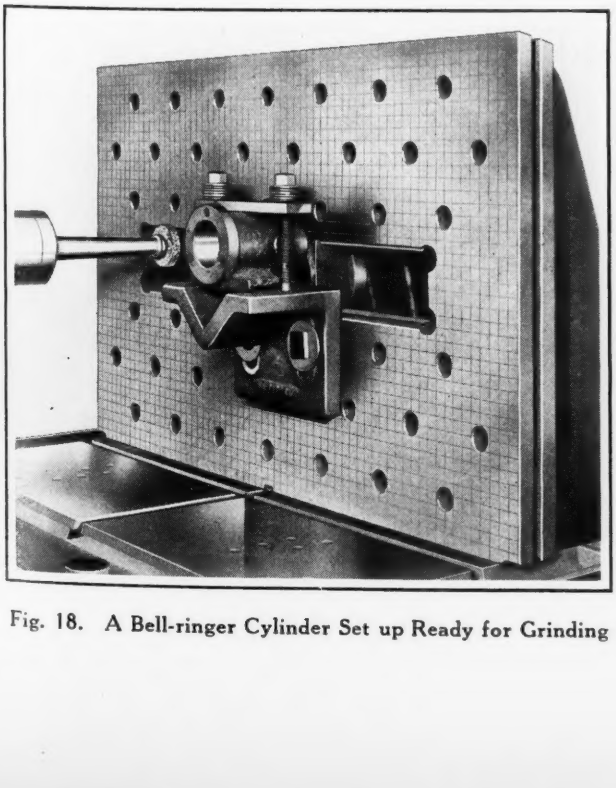


Fig. 18. A Bell-ringer Cylinder Set up Ready for Grinding

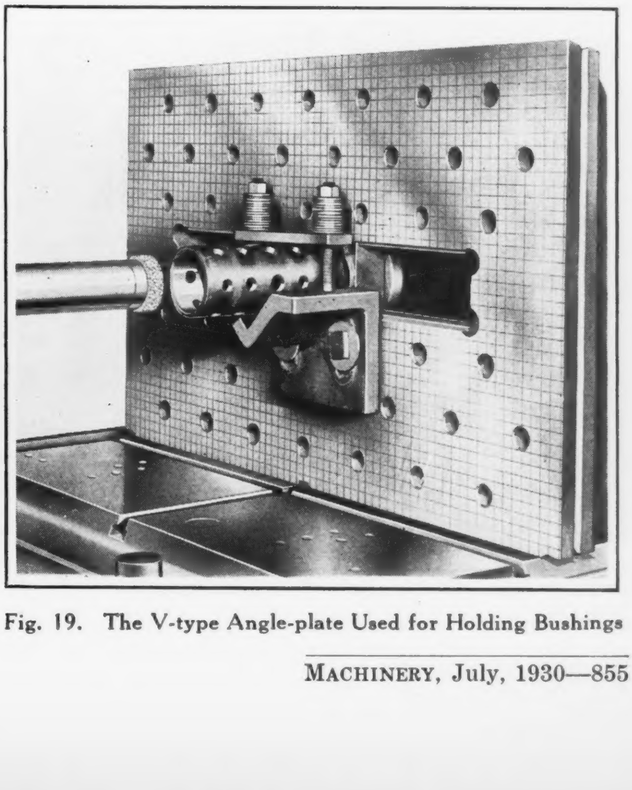


Fig. 19. The V-type Angle-plate Used for Holding Bushings

For link work, a heavy-duty ball-bearing grinding spindle is used to accommodate wide-faced wheels that cover the entire width of the radial surface of the link slot or block. During the grinding operation, the reversing dogs of the machine table are set to provide for approximately 3/4 inch of oscillating movement, so as to prevent hollow grinding as a result of wheel wear. In a number of different railroad shops, Walschaert, Stevenson, and Young types of locomotive valve gear links and blocks are being ground with this attachment.

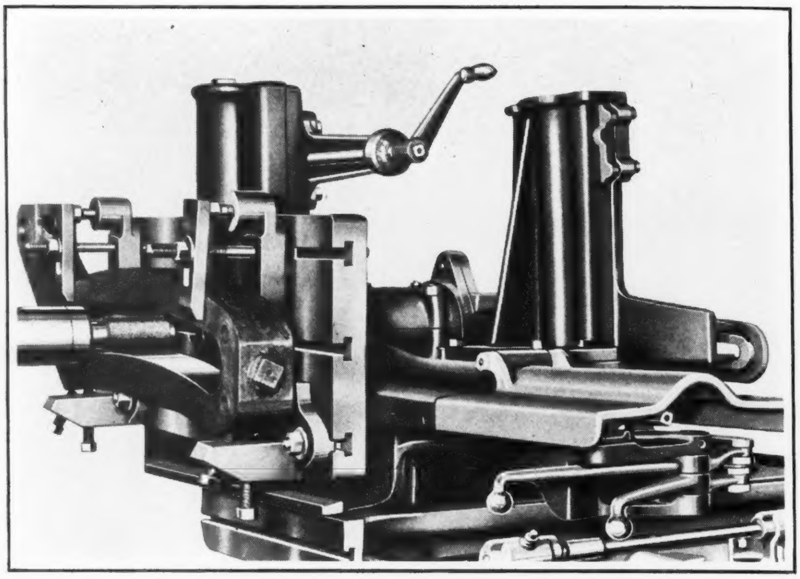


Fig. 20. Link Grinding Attachment Applied to a Micro Grinder

* * *

NEW HEAT- AND CORROSION-RESISTING STEEL

A new alloy steel called "Maxhete," containing nickel, chromium, tungsten, copper, and silicon, has been developed by Edgar Allen & Co., Ltd., Sheffield, England. This material is said to resist the effects of heat and corrosion to a remarkable degree. At room temperatures its maximum stress value is given as 61 tons per square inch, and its reduction in area as 34.8 per cent. At 900 degrees C. (1652 degrees F.) these values are claimed to average 17.4 tons per square inch and 47.2 per cent, as against 4.8 tons and 96 per cent for 0.30 per cent carbon steel, 5.6 tons and 96 per cent for nickel-chromium steel, and 6.1 tons and 95 per cent for stainless steel.

The material has been used successfully in a glass-making plant for certain parts of apparatus that have to withstand temperatures in the neighborhood of 1200 degrees C. (2192 degrees F). Owing to the fact that the steel is in the non-magnetic austenitic state, it is said not to crack and not to harden when quenched in water. Tests in which the steel was heated to between 950 and 1000 degrees C. (about 1740 and 1830 degrees F.) and allowed to cool in air showed that the amount of scale produced was practically nil. Among other successful applications of the steel are burner tubes, damper plates, furnace tubes, recuperators, steam-pipe unions, studs for retorts, and furnace bolts and nuts.

* * *

ENGINEERING INDEX SERVICE

The Engineering Index Service, which is maintained by the American Society of Mechanical Engineers, 29 W. 39th St., New York City, through the Engineering Societies Library, is in a position to furnish photostatic copies of all articles abstracted by the Engineering Index, and can also make translations of any material in the library at a price that merely covers the actual expense involved. This is a service that manufacturers and engineers doubtless would like to know about and make use of when occasion arises.

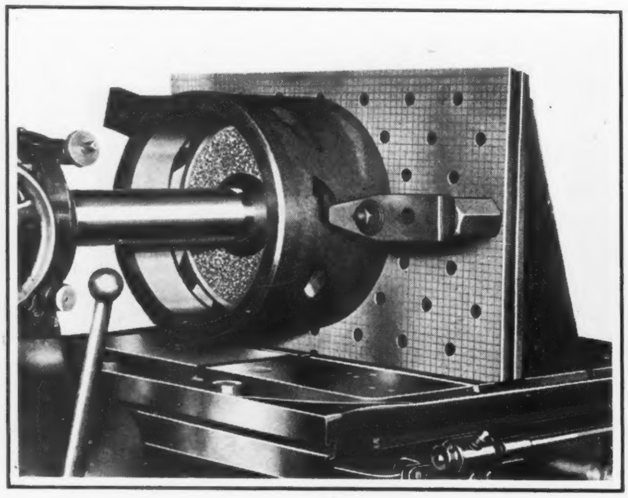


Fig. 21. Grinding a Valve Chest Bushing by Clamping it to the Angle Platen

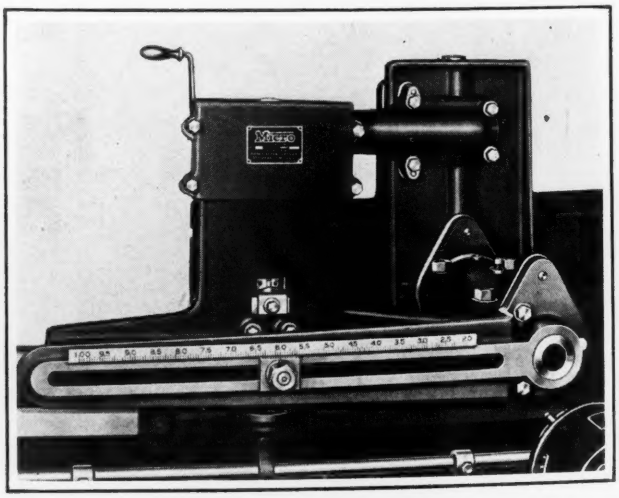


Fig. 22. Scale for Adjusting the Link Grinding Attachment to Different Radii

Notes and Comment on Engineering Topics

Lasting Qualities of Wrought Iron—Trucks Pay Their Share of Highway Construction Expense—A Locomotive Equipped with Roller Bearings

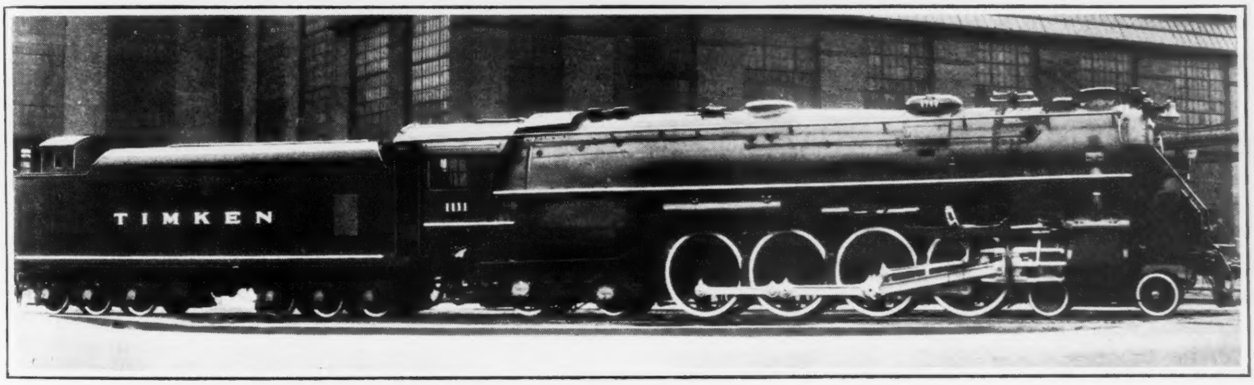
The lasting qualities of wrought iron were strikingly illustrated when the old Tacoma Building in Chicago was demolished recently. This building was forty years old. Wrought iron had been used extensively in the heating and plumbing systems and also in exposed places on the roof. Several vent stacks of that metal were found to be in perfect condition, and, according to the engineer of the old building, no wrought-iron piping had been replaced or repaired in forty years.

An aluminum alloy, said to contain about 13 per cent of silicon, has recently been employed in France in the construction of hydroplanes. This is a cast alloy with one or two per cent of sodium added just before pouring. The castings or ingots are said to have a fine grain structure. They are malleable and slightly lighter than pure aluminum. The strength is from 30,000 to 35,000 pounds per square inch, with the elongation ranging from 7 to 15 per cent. It is said that the metal can be welded easily and that it has a high resistance to corrosion by sea water.

Alfred Reeves, general manager of the National Automobile Chamber of Commerce, points out that one of the most erroneous statements made about commercial vehicle operation is that "the trucks ride free on the highways that are built by the public." Recent statistics gathered by the National Automobile Chamber of Commerce from official government figures show conclusively that the trucks are paying their share of highway construction and maintenance expenses through their registration fees, and that over the country generally, trucks are paying nearly twice as much per vehicle as the passenger automobile. Commercial vehicles comprise only 13 per cent of the number of cars using the highways, but pay more than 25 per cent of the total registration receipts. The higher rate of gasoline consumption, with the accompanying gasoline tax, makes this differential between trucks and passenger cars still greater.

A ROLLER-BEARING EQUIPPED LOCOMOTIVE

For some time there has been a decided interest in the possibilities of anti-friction bearings as applied to the axle journals of steam locomotives. This interest has been stimulated by the record of improved economy and performance made by such bearings on different classes of railroad rolling stock. With a view to obtaining data on the application of tapered roller bearings to locomotives, the Timken Roller Bearing Co., Canton, Ohio, decided to build a locomotive equipped throughout with Timken bearings, suitable for operation on both freight and passenger runs. This locomotive will be lent to different railroads for varying periods to be used in regular service. During its stay on each road, the performance of the locomotive and all the bearings is to be carefully observed and recorded. It is estimated that two years will be required to complete the tests.



A Locomotive Equipped with Tapered Roller Bearings Built to the Order of the Timken Roller Bearing Co.

The American Locomotive Co. built the locomotive to specifications furnished by Timken engineers. The locomotive was turned over to the Pennsylvania Railroad for its first regular tests late in May. The engine has a total length, with tender, of 102 feet; a total weight of 711,500 pounds, the engine alone weighing 417,500 pounds; its maximum speed is 85 miles per hour. Timken bearings are used on the main drivers, the engine trucks, trailer trucks, and tender trucks, and on the crankshaft and idler gear of the Franklin booster. Another feature of the locomotive is the liberal use of alloy steel parts, by which the weight of the reciprocating parts has been reduced 460 pounds on each side of the engine.

Current Editorial Comment

In the Machine-building and Kindred Industries

OPERATING WITH A REDUCED FORCE

If the conditions in the average shop are investigated during a period of depression, when the shop is employing only part of its capacity, it is generally found that the non-productive labor hours are much higher in proportion to the productive labor hours than during periods of normal operation. The expression "non-productive labor hours" means time spent on maintenance of equipment, experimental work, store-rooms, supervision, shipping, and similar work. The productive labor hours are those spent in actually making the products that are sold to customers.

When a factory must be operated with a reduced force, it is highly important that the non-productive labor hours be reduced to correspond with the reduction in productive labor hours. If this is not done, the cost of operating the shop will be too high. It is more difficult to reduce the non-productive labor hours than it is to reduce the productive labor force, but if a shop is to be managed economically during a period of dull business, it is necessary to consider this question carefully.

* * *

ENCOURAGING SUGGESTIONS

Several large concerns have adopted systematic methods of rewarding their employes for suggestions leading to improvements in the design of their product or in their manufacturing methods. There are many things to consider in order to make such a system a success. It is important to make the employes feel that the suggestions are judged with absolute fairness. The awards must be made by a committee of men thoroughly familiar with every phase of the company's work and capable of deciding upon the merits of the suggestions. In order to create still greater confidence, one company permits the employes to select as many representatives on the awards committee as are selected by the management.

The interest of the men in the suggestion system is also maintained by notifying them promptly of the committee's action on the ideas submitted. When a suggestion is received, it is immediately acknowledged. If awarded a prize, the recipient is, of course, notified at once; but if the suggestion is rejected, the man who made it also receives a letter, explaining in detail, and in a tactful manner, the reasons why it could not be adopted.

The secretary of the committee should endeavor to see that no one feels that he has been done an injustice or that his suggestion has not been given fair consideration. Failure to give careful thought to the effect of rejecting suggestions has been responsible for the unsatisfactory results of many suggestion systems. In shops where these systems have been carefully and intelligently handled, they have proved a decided success.

* * *

RECORDS MUST SERVE A PURPOSE

Probably none of the modern ideas in management has proved more useful in the conduct of a business than the compilation of accurate statistics and records pertaining to costs, production, sales, markets, and other factors essential to the success of an industrial enterprise; but the gathering of data and information may be overdone. It is not always advisable to go to the expense of collecting statistics because someone happens to think that it would be a good thing to have such data on file. Before starting to collect information, the use to which it is to be put should be clearly defined and its value ascertained.

Management engineers who investigate the organization of industrial companies with a view to simplifying methods and reducing costs find that records frequently are compiled at great expense that are hardly ever consulted afterward. The first rule, therefore, is to make sure that the information compiled will be effectively used in the conduct of the business. It is also well, at frequent intervals, to check up on all records and card indexes in order to ascertain that the original reason for keeping them still exists. Sometimes conditions change so that records formerly of great value are no longer needed.

* * *

ECONOMY OF BUYING STANDARD PARTS

Many manufacturers believe that they ought to manufacture in their own shop practically everything used in the construction of their machines. Unless the plant is a large one, it may be very wasteful to do this. Many small machine parts are sufficiently standardized so that they can be bought from manufacturers who specialize in producing them, and as these manufacturers are able to produce in quantity, it is frequently cheaper to buy such parts than to try to make them.

One machinery builder who follows this practice has been very successful in so doing. Essential parts that distinguish his design from that of his competitors are made in his own plant, but handles, handwheels, T-bolts, gears, and similar parts are bought from manufacturers specializing in making them. He obtains at a reduced cost as high grade a product as he could make himself, and he can reduce his inventories at the same time.

Depreciation of Mechanical Equipment

A Review of the General Practice of Estimating Depreciation Based on Data Obtained from Different Branches of the Mechanical Industry

THE depreciation or reduction in value of mechanical apparatus is estimated in advance in order to determine what funds should be set aside periodically to provide for the purchase of new equipment. These advance estimates should be based upon past experience with similar equipment and conditions, as far as possible, but in many instances it is necessary to assume certain values with the idea of changing them if subsequent experience indicates that such changes are necessary.

Depreciation percentages, even for the same types of equipment, vary considerably, because they are affected by certain variable factors, such for example, as (1) extent of wear resulting from use of equipment, which varies according to method of using, location, etc.; (2) obsolescence or reduction in value due to development of more efficient apparatus (in this connection either a reduction or an increase in replacement value of new apparatus may have to be considered); (3) care of equipment, both as regards operating conditions and proper maintenance and repairs; (4) possibility of minor changes in apparatus to avoid obsolescence partly or entirely.

It is evident that such factors as the ones mentioned vary widely for different classes of manufacturing and other equipment. Certain types of machines and tools, for example, depreciate in value as the result of wear only; whereas other types become obsolete and are uneconomical to use because an improved design or possibly a different class of machine or tool has been developed. Since it is impossible to anticipate most new developments, depreciation percentages may be subject to considerable revision, and the plan should be to amend them whenever facts are ascertained that make such revision possible. Thus depreciation rates that usually are based upon judgment and experience can be verified by checking the perpetual inventory values established by these rates against actual losses that may occur when equipment is discarded.

The following depreciation rates, all of which are given as percentages of the original cost, have been obtained from various sources. The extreme variations recommended by different authorities are given to indicate the fluctuations that may take place under varying conditions. The average percentages, together with the number of sources upon which the averages are based, are also included.

Belting—Main belts, range 5 to 25 per cent; average from eleven sources, 12 per cent. Machine belts, 25 to 50 per cent.

Motors—Range 4 to 10 per cent; average from twelve sources, 7 per cent.

Engines, Reciprocating Steam—Range 4 to 10 per cent; average from thirteen sources, 6 per cent.

Engines, Turbine Type—Range 3 to 7 per cent; average from thirteen sources, 5 per cent.

Engines, Gas—Range 5 to 10 per cent; average from eight sources, 7 per cent.

Boilers—Range 4 to 10 per cent; average from eighteen sources, 6 per cent.

Pumps—Range 3 1/2 to 8 per cent; average from nine sources, 5 per cent.

Hoists—Range 7 to 12 per cent.

Cranes—Range 2 to 10 per cent; average from eight sources, 6 per cent.

Machine Tools—Common range for standard types subject to normal usage, 5 to 10 per cent. For manufacturing types or special designs used continuously, range may vary from 15 to 30 per cent. Each type of machine tool must be considered separately, because of the wide variety of operating conditions and the numerous developments in the machine tool industry that cannot be predetermined.

Machinery in General—Range 5 to 13 per cent; average from eight sources, 9 per cent.

Dies—Range 25 to 50 per cent; average from four sources, 40 per cent. The cost of tools of this class, when made for a particular order, should be charged to that order.

Hammers, Drop and Steam—10 per cent.

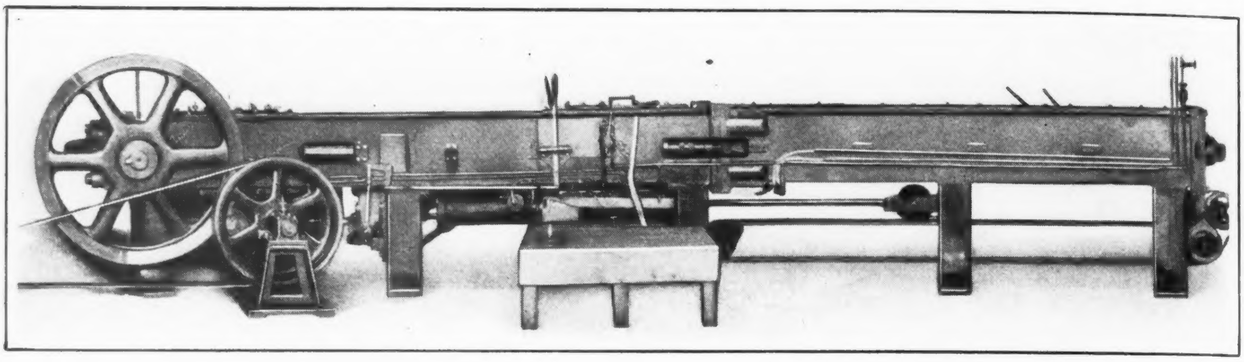
Patterns—Range 20 to 100 per cent; average from six sources, 65 per cent. Metal patterns have a lower depreciation rate than wood patterns, but in any case when patterns are made for a particular job, the entire cost should be charged to that job.

The foregoing figures are intended chiefly as a general guide or as a basis for setting tentative depreciation rates until these estimated figures can be replaced with percentages based upon data obtained from actual experience.

* * *

HOW CAN A FOREMAN KEEP HIS EQUIPMENT IN GOOD CONDITION?

In a foremen's conference, the following suggestions were made on methods that would enable a foreman to keep the equipment in his department in good condition. In the first place, he should check it periodically for needed repairs. Jigs should be checked up after the first piece has been made, and jigs and tools should also be checked after a job is completed, before they are returned to the tool-room. Any trouble with machines should be investigated immediately and necessary repairs made as soon as possible. The operator should be instructed as to his duties in caring for the machine. Advantage should be taken of slumps in business to do general overhauling, and old equipment should be salvaged and kept for repair work.



The Manufacture of Thin-Wall Tubing

A New Development by which Tubes up to 9 Inches in Diameter and 20 Feet Long are Made with Walls as Thin as 0.004 Inch

By WILLIAM S. LYHNE, Manager Tubing Division, Fulton Sylphon Co.

IN the ordinary process of drawing tubing, which involves pulling the tube through a die and over a ball to reduce the diameter and wall thickness, it is evident that the tube is subjected to considerable tensile stress, and when attempts are made to draw tubing having very thin walls, this tensile stress may exceed the ultimate strength of the material, so that the tube is pulled apart. Breakage of tubes from this cause is more likely to occur as the tube diameter increases for a given wall thickness and material, on account of the resulting increase in tube area and, consequently, in frictional resistance between the tube and the die.

The tensile strength of the tube that has passed through the die must be greater than the sum of the drawing force and the frictional resistance of the tube in the die and over the ball. As the wall thickness of the original tube is reduced, the frictional resistance in drawing the tube through the die and over the ball approaches the ultimate tensile strength of the tube, and hence it is necessary to make less reduction in the wall thickness at each pass. The number of operations required to make very thin-wall tubing is therefore multiplied to such an extent that the draw-bench method is impractical for producing thin-wall tubes.

The interesting tube-drawing machine to be described, which is a development of Weston M. Fulton and Jean V. Giesler of the Fulton Sylphon Co., Knoxville, Tenn., is designed especially for drawing thin-wall tubing, and has proved very successful. In fact, with this type of machine, tubing with a wall thickness of only 0.004 inch and in any diameter from 1 inch to 9 inches is being drawn commercially, and a remarkable feature of the process is that the loss from scrap due to the parting or breaking of these thin-wall tubes is less than 1 per cent. Similar losses when the ordinary draw-bench

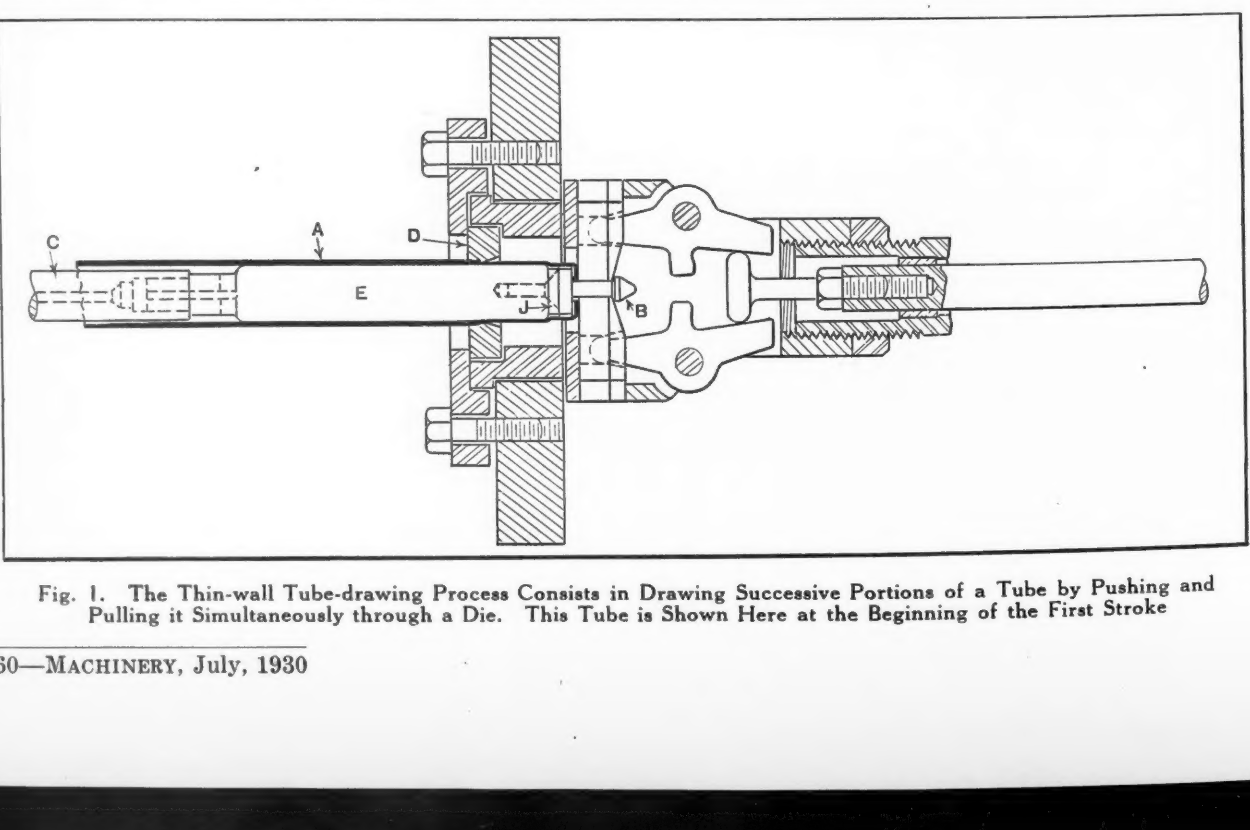


Fig. 1. The Thin-wall Tube-drawing Process Consists in Drawing Successive Portions of a Tube by Pushing and Pulling it Simultaneously through a Die. This Tube is Shown Here at the Beginning of the First Stroke

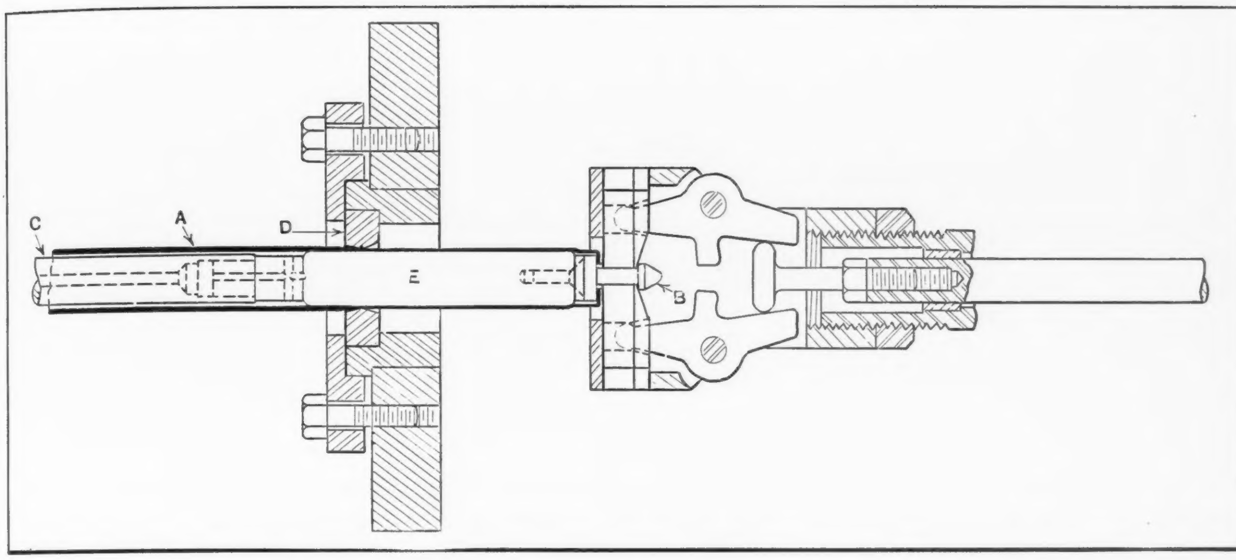


Fig. 2. Position of the Tube, Pulling Head, and Pushing Plunger at the End of the First Stroke, the Tube having been Pulled through the Die 8 Inches

method is employed sometimes amount to as much as 35 per cent, depending upon the thickness and diameter.

These remarkably thin-walled tubes are now made in volume production, and the wall thickness, inside diameter, and outside diameter, are held to closer tolerances than have heretofore been practical. Tubes made by this method also have the properties of shells drawn in a power press, and can be used under conditions where tubes produced by the draw-bench method do not give satisfactory service.

Until this invention was perfected, the following wall thicknesses were minimum for commercial tubes: For diameters from 1 inch to 2 1/4 inches, 0.025 inch; for diameters from 2 1/2 to 5 1/2 inches, 0.035 inch; for diameters from 5 3/4 to 6 inches, 0.042 inch; for diameters from 6 to 6 3/4 inches, 0.049 inch; for diameters from 7 to 7 3/4 inches, 0.058 inch; and for diameters from 8 to 9 inches, 0.083 inch.

Principle of the Thin-wall Tube-drawing Process

A novel feature of this machine for drawing thin-wall tubing, which accounts for its successful operation, is that the tube, as it passes through the die, is subjected to both a pulling and pushing action. Another feature that distinguishes this machine from the ordinary draw-bench is that the tube, instead of passing through the die in one continuous motion, is given a series of intermittent movements each equal to 8 inches.

The diagrams Figs. 1, 2 and 3 illustrate the principle of this process. Fig. 1 shows the relation between the tube *A* and the die *D* at the beginning of the drawing operation. The end of the tube extends a short distance through the die, and it is also closed in partly to form a shoulder; or if the tube end is entirely closed, a hole is drilled to allow one end of tail-piece *B* to project beyond the end of the tube. The tail-piece *B* bears against the tube shoulder, and the end that extends through the tube is gripped by the head of the machine which does

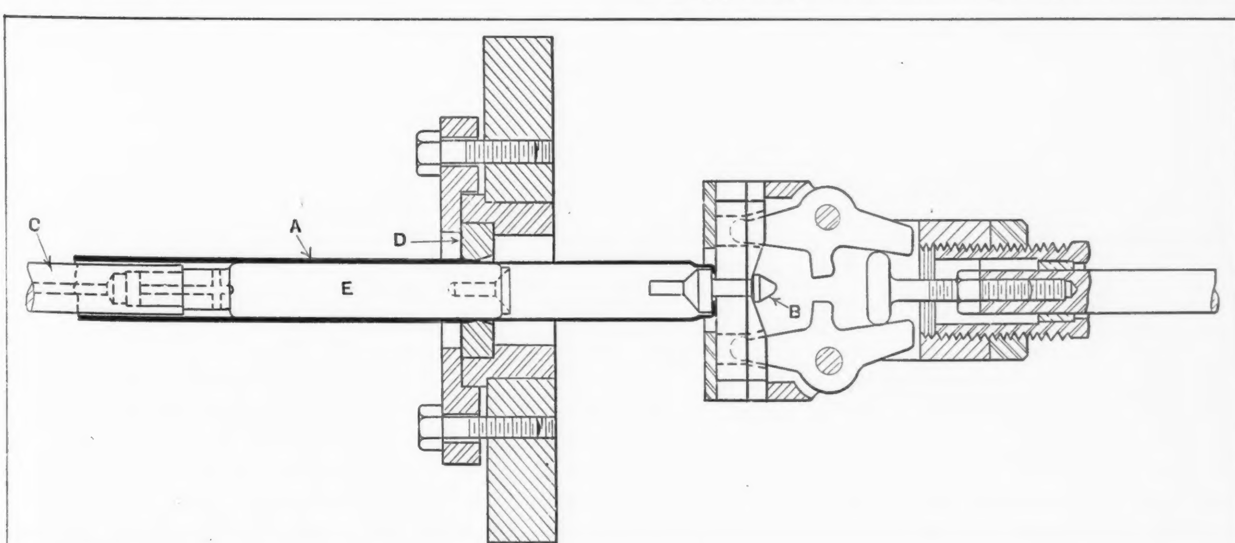


Fig. 3. The Pushing Plunger E has Returned to the Starting Position Preparatory to Moving Forward Again with the Pulling Head a Distance of 8 Inches, thus Reducing the Tube by a Series of Drawing Movements

the pulling. Inside the tube there is a rod or plunger C which has attached to its end a slightly enlarged extension E. This extension plunger E is hardened and fits closely inside the tube.

When the drawing operation begins, the pulling head attached to tail-piece B, and rod C with its plunger E, both move in unison and each have an 8-inch stroke. The extent of this movement for one stroke is represented by the diagram Fig. 2. As plunger E is pushed through the die at the same rate as the tube is being pulled by the head, the plunger exerts considerable pushing effort, so that for a given amount of reduction, the tensile stress on the tube wall is lessened considerably; consequently, it is possible to draw tubing having exceptionally thin walls without breakage. Approximately the same percentage of reduction in wall thickness is made, regardless of the thickness of the original wall.

When plunger E and the head attached to B have reached the end of their 8-inch stroke, as indicated in Fig. 2, plunger E returns to the starting position, but the pulling head and tube are positively held against any return movement, so that the relative positions of plunger E and the tube are now as shown in Fig. 3. Plunger E and the pulling head then again move forward 8 inches, and these intermittent movements are repeated until the entire tube length has passed through the die.

After all the tubes in a given lot have been reduced to a certain size in this manner, the machine is equipped with a smaller plunger E and a smaller die for redrawing and further reducing the tubes, and this replacement of plunger E and die D with successively smaller sizes is repeated until the tube is drawn to the required diameter and wall thickness. The total number of passes depends, of course, upon the wall thickness, and to some extent, upon the material.

Type of Machine Used for Drawing Thin-wall Tubing

Now that the operating principle of the thin-wall tube-drawing process has been described, the relation between this process and the tube-drawing machine will be understood readily. One of these machines is shown by the heading illustration and also by Figs. 4, 5 and 7. Because of the length of this machine, it was impossible to reproduce the entire machine in one complete drawing and on a large enough scale within the limits of MACHINERY'S page; consequently three sections of the machine, representing front elevations, are shown in Figs. 4, 5, and 7. Fig. 4 is the left-hand section; Fig. 5, the intermediate section; and Fig. 7 the right-hand section. The reference letters on the diagrams Figs. 1, 2, and 3 represent corresponding parts in Figs. 4, 5, and 7.

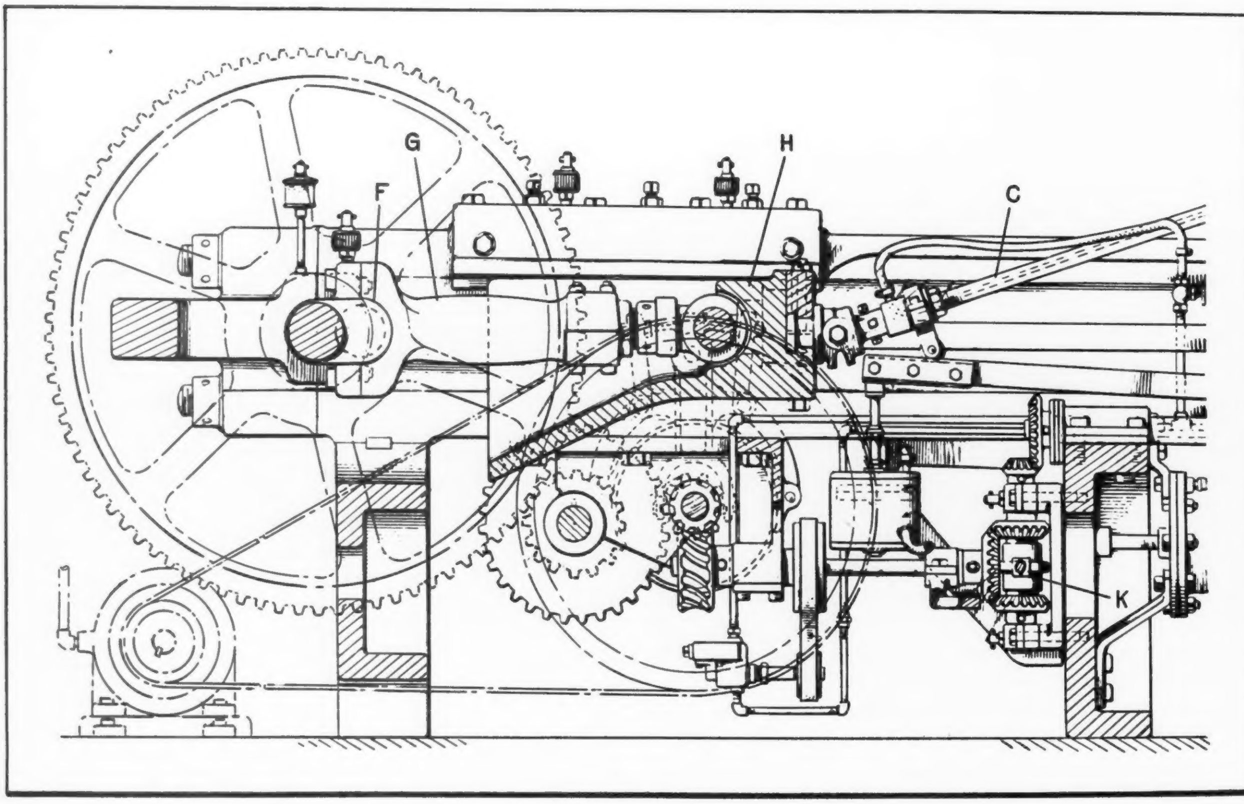


Fig. 4. View of Left-hand Section of Tube-drawing Machine, Showing Crank Mechanism which Drives the Tube Pushing and Pulling Members—Reproduced from Original Drawing

The reciprocating motion of rod C and plunger E is produced by an ordinary crank mechanism similar in its arrangement to a power press, except that it is in the horizontal position. A crank F (Fig. 4) is connected by a pitman G with crosshead H, to which the rod C is attached. The connection between C and H is such that C can be inclined upward (see Figs. 4 and 5) so that the tube to be drawn can readily be placed over it. First

the tail-piece *B* (Fig. 1) is placed on the end of plunger *E*, where it is held temporarily by a small conical center *J*. The tube is then inserted over the plunger, as in Fig. 5, and the plunger is lowered to the horizontal position, thus bringing the tube in line with the die.

The head containing the die *D* (see Fig. 5) is next moved to the left far enough so that the reduced end of the tube fits snugly into the die, the tail-piece *B* projecting through as shown in Fig. 1. This preliminary adjustment of the head is controlled by a clutch *K*, Fig. 4, through which screw *L* (Fig. 5) connecting with the die-head slide, is rotated. The pulling head *M* (Fig. 7) is next moved to the left and up to the die-head close enough to grip the tail-piece *B*. This movement on the particular machine shown is effected by an air-operated mechanism consisting of a cylinder *N* (Fig. 5), piston-rod *O*, and a system of pulleys over which a wire cable *P* passes. This cable is attached to the right- and left-hand sides of the pulling head in order to exert a pull in both directions and eliminate play.

The 8-inch stroke of the crank mechanism is imparted to the pulling head through two rods *Q* (Fig. 7) which connect with the cross-head and extend slightly beyond the right-hand end of the machine. As these rods move to the right for the drawing stroke, they carry with them two racks *T;* a pair of these racks is located on each side of the machine. The lengthwise movement of the racks is transmitted to the pulling head through four pawls which are pivoted to the head. These pawls are engaged with the racks during the forward stroke and disengaged during the return stroke by toggle mechanisms, one of which may be seen at *S*. The same toggle mechanisms also serve to lock the pulling head against any return movement by engagement with pairs of racks *R* and R_1. The notches on all of these racks are spaced 8 inches apart to correspond to the stroke obtained from the crank mechanism.

The intermittent drawing movements are repeated until the full length of the tube has passed through the die; the tube is then removed as the drawing head engages a valve which opens the jaws grasping the tail-piece. The operating parts then return automatically to the starting position.

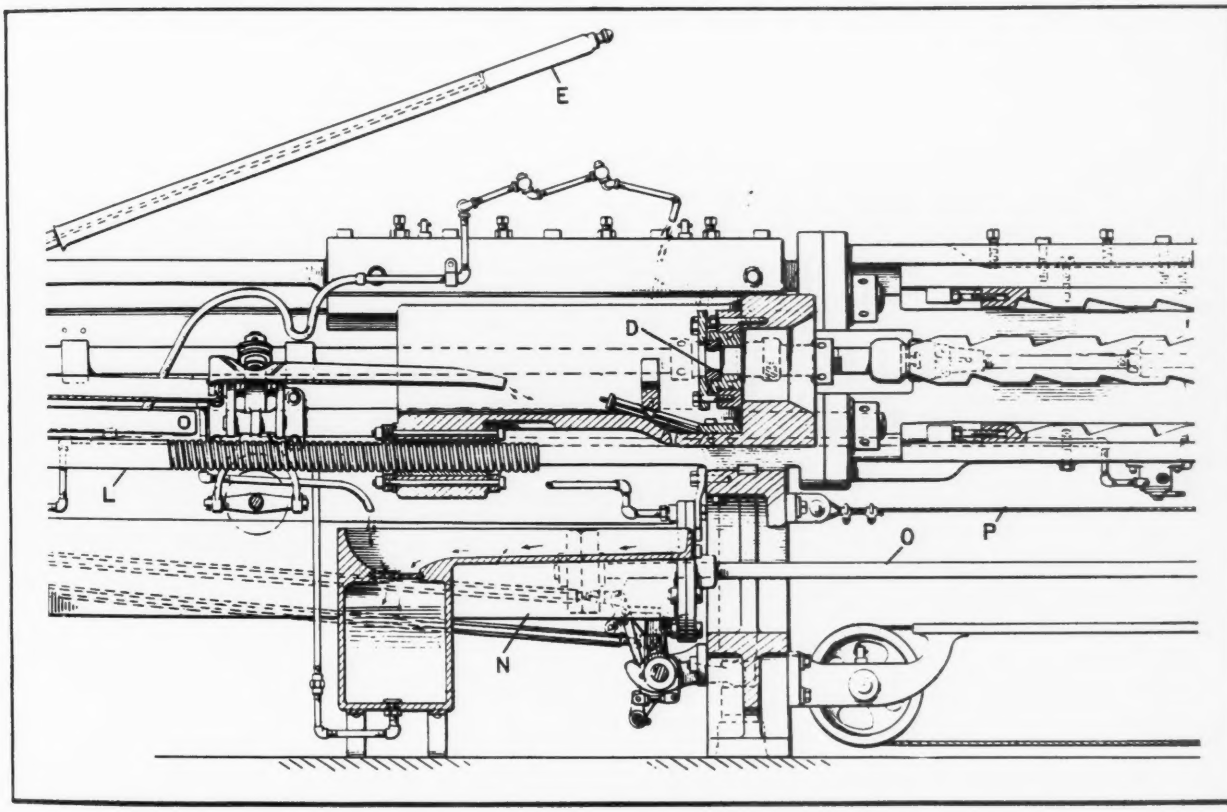


Fig. 5. Central Section of Tube-drawing Machine Including Die-head and its Adjustable Slide—Reproduced from Original Drawing

The dies used are made of suitable steel accurately ground and lapped to size. The land or cylindrical part of the die is only about 1/16 to 3/32 inch wide, because it has been found that such a narrow land wears better than one of considerably greater width. In redrawing commercial tubing, the amount of reduction per pass or draw is equal to from 40 to 50 per cent of the wall thickness. The tube is drawn at the rate of 80 to 320 inches per minute, the higher speeds being used on the smaller sizes of tubing.

Redrawing Commercial Tubing—Drawing Tubes from Cup-shaped Castings

These tube-drawing machines were developed originally for producing the thin-walled tubing required by the Fulton Sylphon Co. in the manufacture of certain classes of temperature controlling

apparatus that require not only thin-walled tubing but considerable accuracy in regard to the uniformity of the wall thickness. This tube-drawing process has been commercially applied to non-ferrous metals, such as zinc, brass, aluminum, and copper. Practically any metal can be drawn by this method and the tubes have a superior finish and a uniform thickness of wall for the full length.

This thin-walled tubing is produced in some cases by redrawing ordinary commercial tubing, or the process may start with sheet metal. Another method involves all the preliminary work, and consists in first casting a cup-shaped part containing enough metal for the tube required. This cup is then gradually reduced and lengthened. One of the cups used for brass tubing is shown in Fig. 6. This cup is first given three drawing operations in a screw type of drawing press, and then six additional drawing operations in the special press described in this article, thus producing a tube 10 feet long with a wall thickness of 0.015 inch. The cast cup for making tubes in this way may or may not be machined. Although machining is usual, tubes drawn from unmachined cups using cast-iron dies have proved satisfactory.

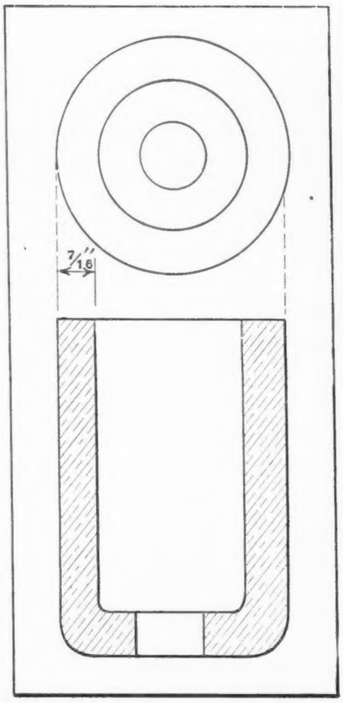


Fig. 6. Nine Drawing Operations Change This Cast Cup into a Tube 10 Feet Long and 0.015 Inch Thick

When commercial tubes are redrawn, the seamless variety is used ordinarily. It has been demonstrated, however, that tubing having a brazed seam can be redrawn in the thin-wall tubing machine without leaving any trace of the brazed seam so far as physical properties are concerned. Another interesting fact about this machine which illustrates its possibilities is that zinc tubing may be made commercially in the same lengths and wall thicknesses as other metals. The drawing of zinc usually presents great difficulties, owing to its low strength and its peculiar crystalline or flaky formation. This process has also been applied successfully to the production of tubing of special shapes, such, for example, as corrugated forms.

* * *

The facilities of the Mellon Institute of Industrial Research at Pittsburgh, Pa., will be considerably enhanced by the addition of a new building to be erected this fall. This building will provide greatly increased space for laboratories and will also accommodate a very large library, having space for 250,000 volumes. The structure will be 300 by 400 feet, seven stories high.

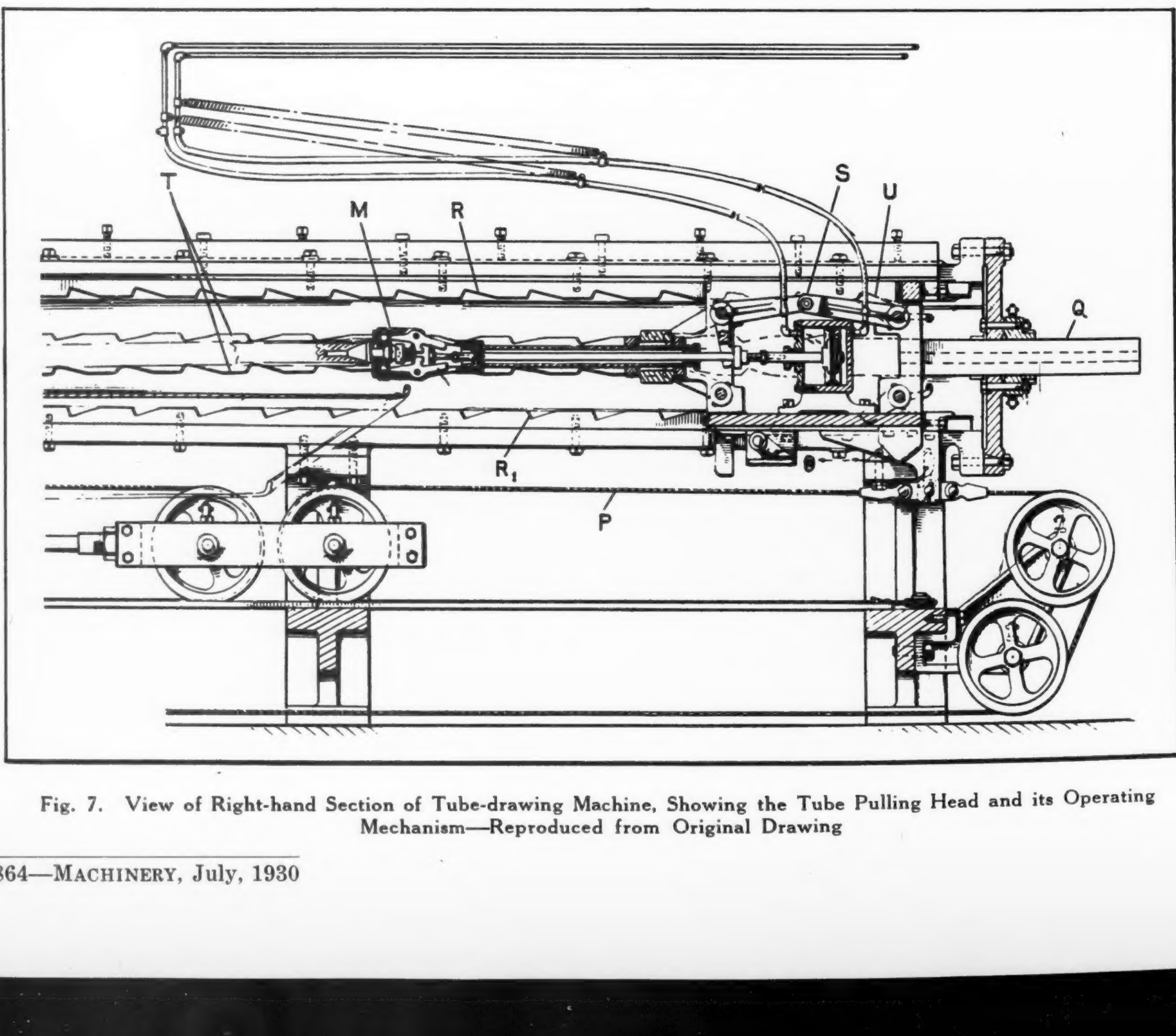
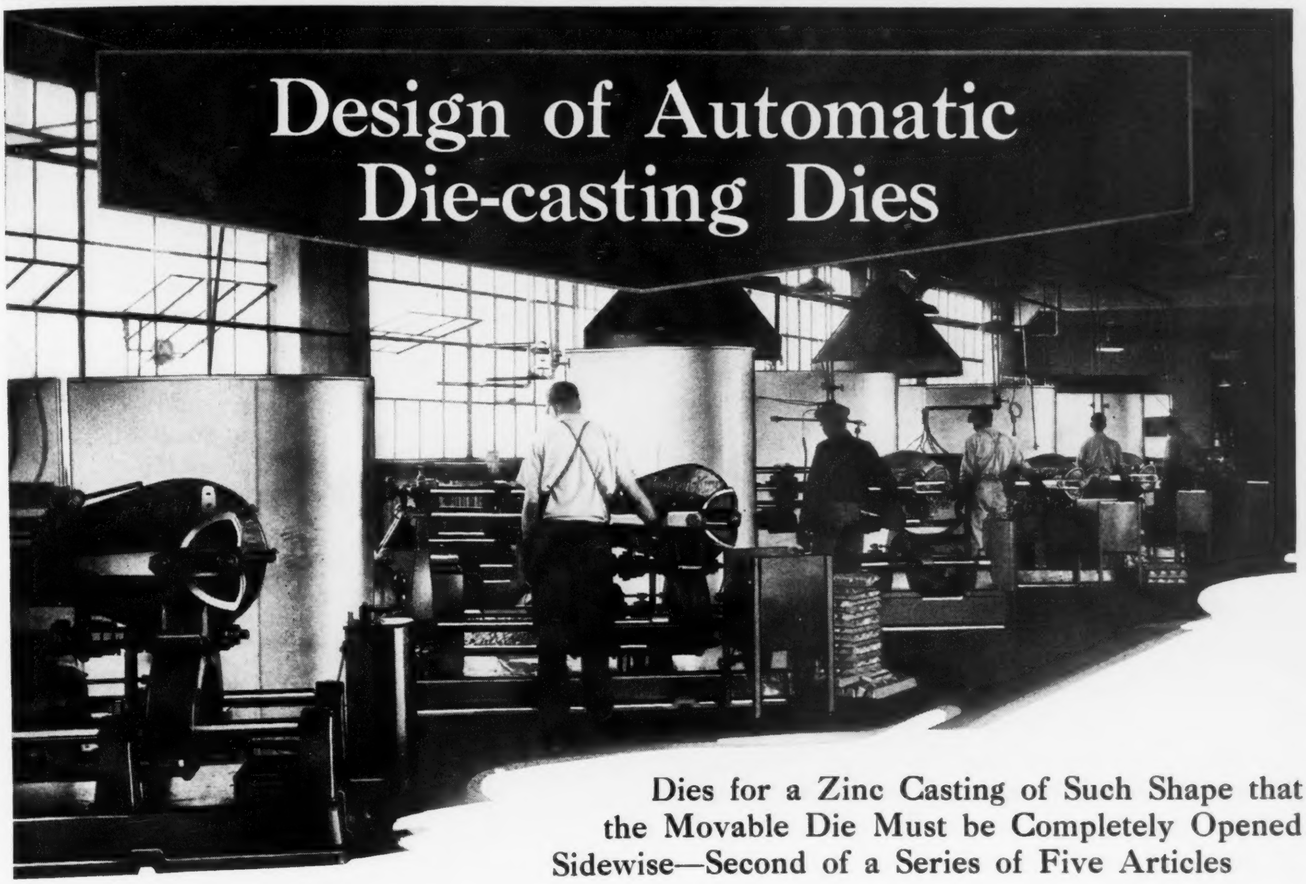


Fig. 7. View of Right-hand Section of Tube-drawing Machine, Showing the Tube Pulling Head and its Operating Mechanism—Reproduced from Original Drawing

Design of Automatic Die-casting Dies



Dies for a Zinc Casting of Such Shape that the Movable Die Must be Completely Opened Sidewise—Second of a Series of Five Articles

By CHARLES O. HERB

COMPLETELY automatic operation of all moving cores is one of the main features of the dies used in the die-casting machines built by the Madison-Kipp Corporation, Madison, Wis. In the previous article of this series, which appeared in May MACHINERY, it was pointed out that mechanisms are incorporated in the dies themselves for operating the cores automatically. Wherever possible, all movable cores are concentrated in the movable die and are operated by rollers mounted on slides or levers attached to the dies which are carried along cam blocks fastened to combination bars on the machine. This action occurs as the movable die carriage moves forward and backward to close and open the two dies. When it is desired to have the cores slide in stationary dies, movement is transmitted to them from one of the regular members of the machine through bellcrank levers on the dies.

Fig. 1 shows a carburetor casting of a design requiring the use of a movable die that opens sidewise after it has withdrawn from the stationary die. In addition, cores sliding in five directions are required. The movable die is illustrated in Figs. 6 and 7, Fig. 6 showing the various sliding members in the casting position, and Fig. 7, in the positions they occupy when the movable die is withdrawn from the stationary member. Fig. 8 shows the stationary member of the die. The casting produced is approximately 6 5/8 by 3 1/4 by 2 7/8 inches

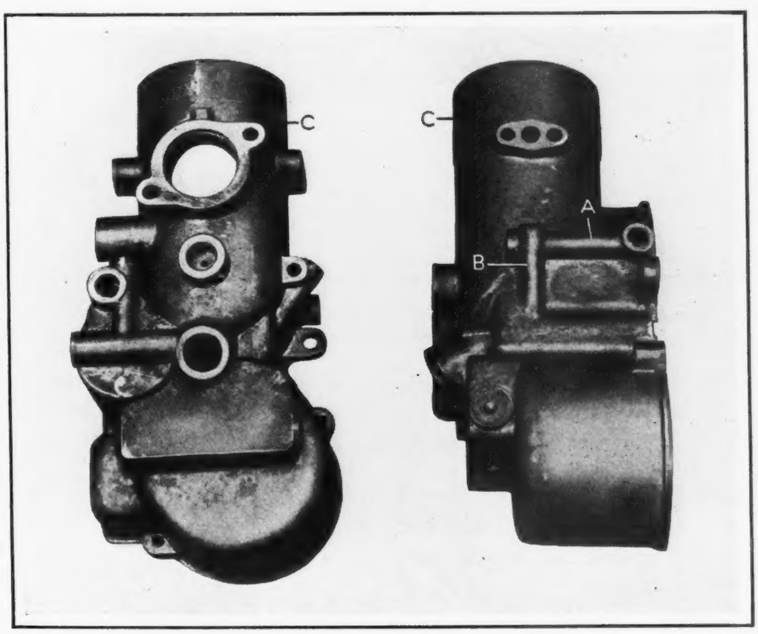


Fig. 1. Die-casting Produced in Movable Die that has Cores Sliding in Five Directions and that Opens Sidewise

in size, and weighs about 1.6 pounds. The production averages 70 castings per hour.

With the dies described in the preceding article, combination bars on top of the machine actuate sliding cores in the movable dies. A similar arrangement is employed to actuate the cores in the movable die here shown, except that in this case, two such bars are provided on top of the machine and two on each side, six bars being required in all. These combination bars are fitted with cam blocks in a manner similar to that shown in Fig. 4 of the previous article. As rollers attached to the different operating levers of the movable die here illustrated pass along the cam blocks of the combination bars when the die carriage of the machine moves back and forth to open or close the dies, the different sliding parts are moved into place or withdrawn as required.

Cores are Withdrawn before Die Opens Sidewise

Assuming that the movable die is closed against the stationary die, with all sliding parts positioned as shown in Fig. 6, when the movable die starts to withdraw, bell-crank lever *F*, Fig. 3, is swiveled to raise slide *G*. This slide has a cam slot *a* in it which is engaged by a small roller attached to the holder in which core *H* is mounted. Consequently, as slide *G* is raised, core *H* is withdrawn horizontally. This core produces the hole in boss *A*, Fig. 1.

The same mechanism is used to withdraw the core that forms the hole in boss *B*, Fig. 1. This core is indicated at *J*, Fig. 2, and its movement is effected through a cam slot *b* which is machined in the face of slide *G* at right angles to the face on which cam slot *a* is provided. A roller attached to holder *K* of core *J* engages cam slot *b*, and so as slide *G* is raised, the holder is withdrawn along slot *d* of the die body at an angle of about 30 degrees with the vertical.

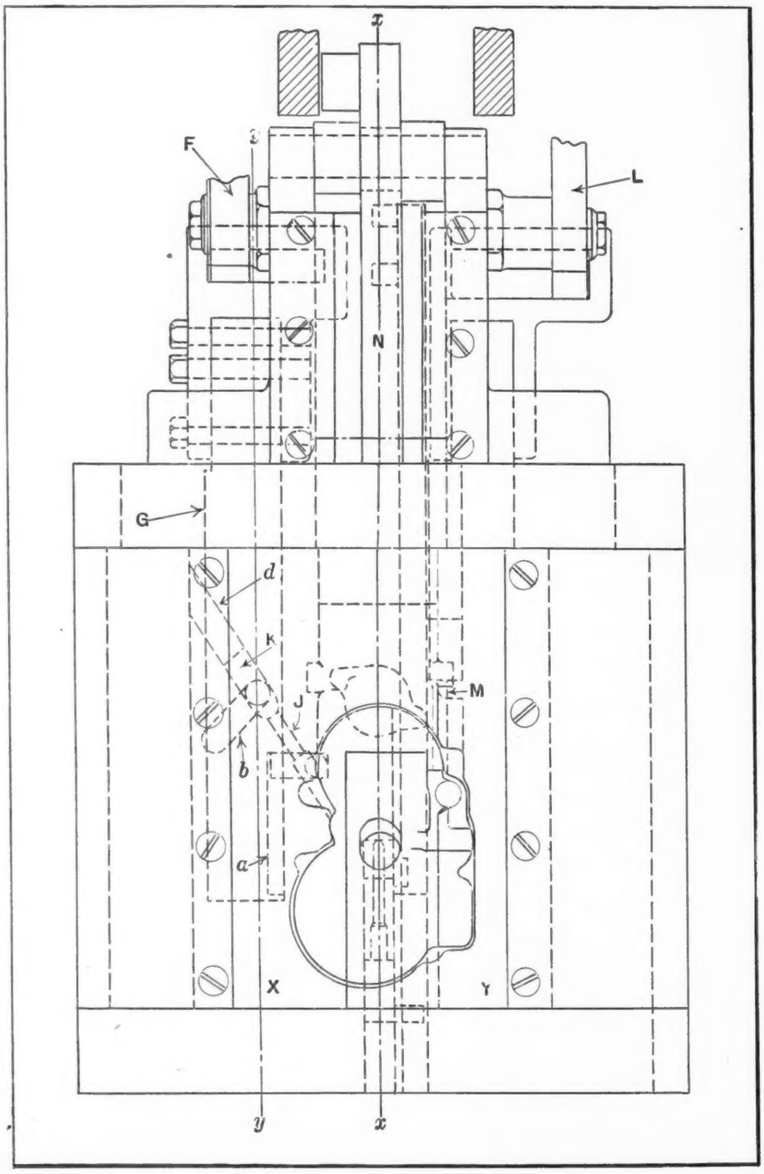


Fig. 2. Mechanism Employed for Moving a Core at an Angle of 30 Degrees with the Vertical

While the mechanism just described is in operation, lever *L* on the opposite side of the die is swiveled by the cams of the second combination bar on top of the machine, thus raising the slide to which the slender core *M* is attached. This core is given a direct vertical movement of approximately 1 1/4 inches.

Rod *N* is also lifted simultaneously to impart a vertical movement to the large round core *O*, Figs. 4, 6, and 7, which extends to the middle of the die cavity for forming the hole in the tubular end *C*, Fig. 1, of the casting. Core *O* has a movement of about 4 1/2 inches. Near the end of this movement a slight vertical movement is also imparted to the slender core *U*, Fig. 4, attached to slide *N*. This core produces a hole about 1/16 inch in diameter in a boss on the casting. Roller *V*, which is held in two bearings of the die proper, offers a sidewise support to slide *N* in its vertical movements.

Lever *P*, Fig. 4, is attached to the movable die carriage and is operated by a roller at its upper end which engages cam blocks on one of the combination bars on top of the machine. Thus, it will be obvious that cam blocks are used on both sides of the two top combination bars. When lever *P* is swiveled as the movable die carriage is withdrawn, it moves slide *Q* down. On one side of this slide there is a cam slot *e* which is engaged by a roller mounted on the sleeve of core *R*. Therefore, as slide *Q* moves down, this core and its sleeve are withdrawn along hole *f*. Simultaneously, core *S*, with holder *T*, is lowered 1 1/2 inches by lugs on slide *Q*.

How the Dies Open Sidewise

After the movable die carriage has been withdrawn sufficiently to permit the operation of all sliding cores in the manner just described, the

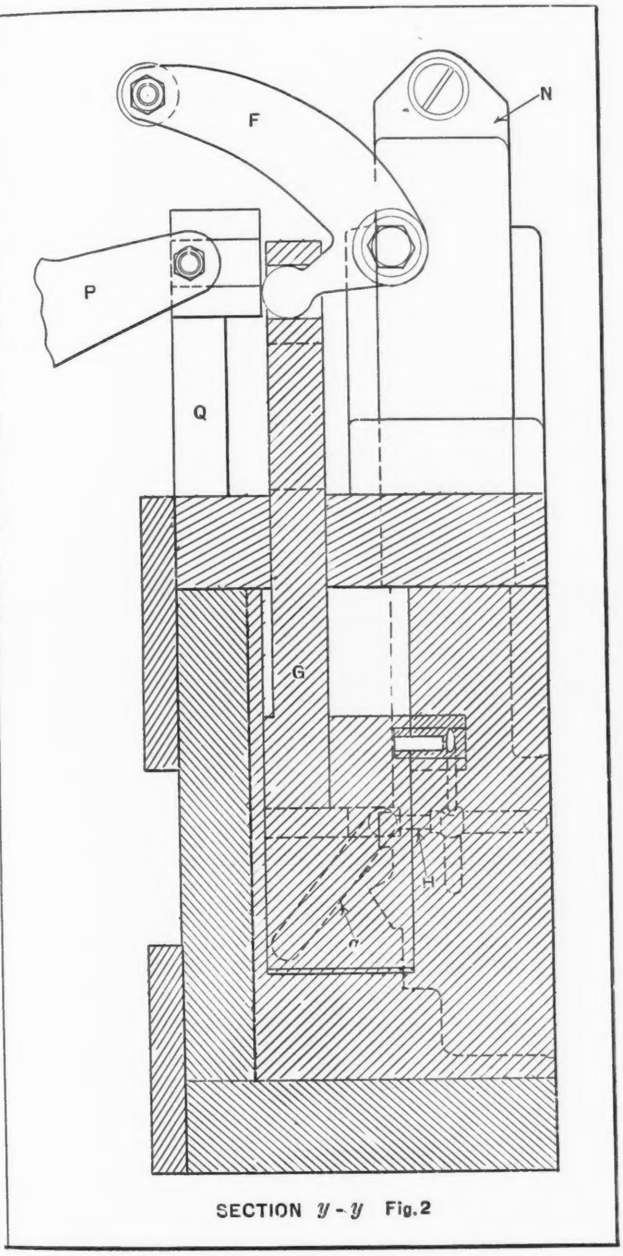


Fig. 3. Sectional View of Movable Die, Showing Arrangement Used for Moving a Core Horizontally

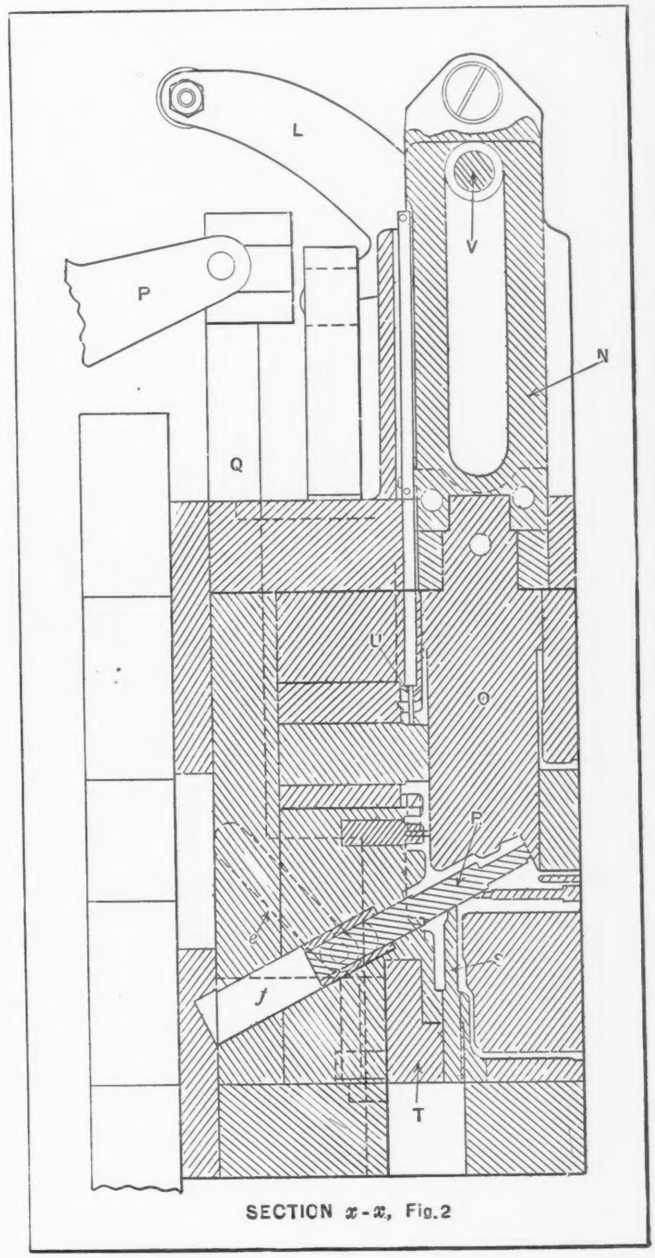


Fig. 4. Section Showing Means Employed for Moving Three Cores Vertically and One Core at an Angle

rollers on the outer ends of rods *W*, Figs. 6 and 7, engage the cam blocks of the side combination bars in such a way as to pull the slides on which die-blocks *X* and *Y* are mounted away from each other. These rods are not shown in Fig. 2; however, they are fastened directly to the die slides and pull these members straight out.

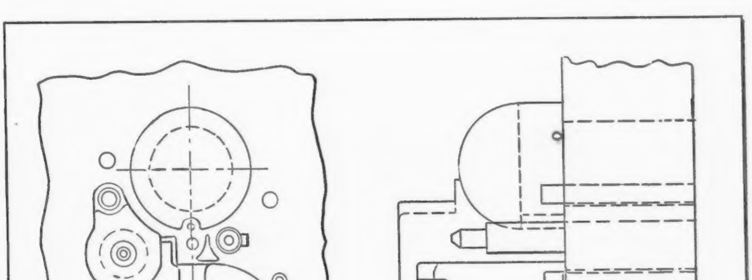


Fig. 5. Fixed Cores on Face of Stationary Die (Fig. 8)

Levers *F* and *L* operate in the slots of brackets *Z*, which are clearly shown in Fig. 7. These slots provide clearance for the levers during the outward movement of die-cavity blocks *X* and *Y*, brackets *Z* and the slides on which they are mounted traveling with these blocks.

From Figs. 5 and 8 it will be observed that the stationary

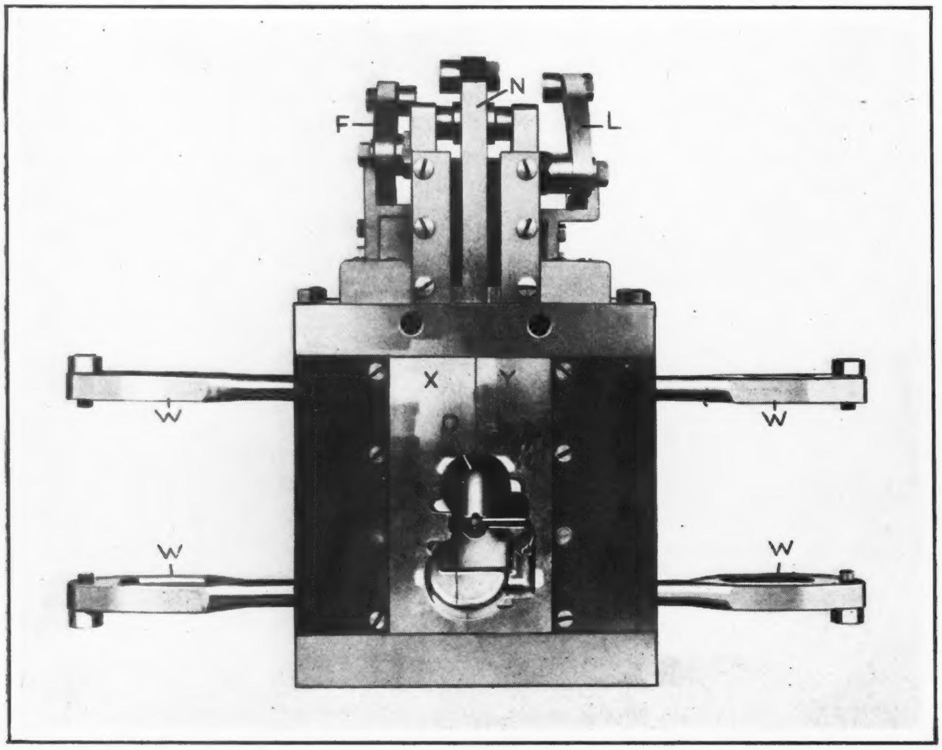


Fig. 6. Movable Die with All Moving Cores and the Two Cavity Slides in the Casting Position

die consists principally of a series of fixed cores which project from the face of the die plate. The sprue and the passages through which the molten metal flows to the die cavity in the movable die under a pressure of 350 pounds per square inch are cut entirely in the stationary die. Pilot pins on the stationary die engage holes in the movable die to register the two die members accurately in the casting position.

The next article of this series will appear in August MACHINERY. Patents have been applied for to cover the various movements described in this series.

* * *

A list of books on machine shop practice, suitable for use in apprentice training courses and trade schools, as well as for home study, has been compiled by the public library of Newark, N. J. Those interested may obtain copies of the list by applying to the Newark Public Library, Newark, N. J., and enclosing 5 cents to cover mailing cost.

LABORATORY OF THE NEW JERSEY ZINC CO.

An unusually attractive book describing the technical department of the New Jersey Zinc Co., and featuring the research laboratory of the company at Palmerton, Pa., has recently been published by this company. The book reviews the different divisions of the technical department, and illustrates and describes briefly the different laboratories for X-ray, spectrographic, and microscopic studies, and for the investigation of different properties of pigments and paints. The illustrations of the physical, metallurgical, and chemical laboratories indicate the unusually complete equipment available for research work in connection with the many varying uses of zinc and zinc products. A small die-casting plant is included in which research work on the properties, tensile strength, and impact resistance of die-castings will be carried out.

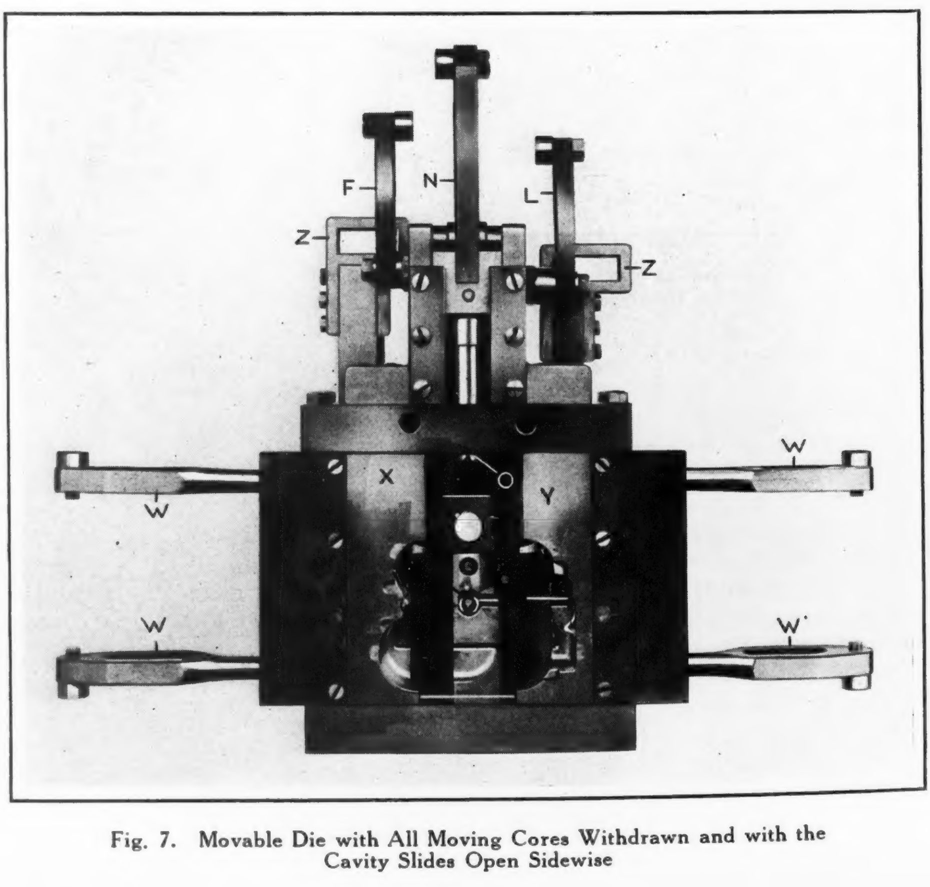


Fig. 7. Movable Die with All Moving Cores Withdrawn and with the Cavity Slides Open Sidewise

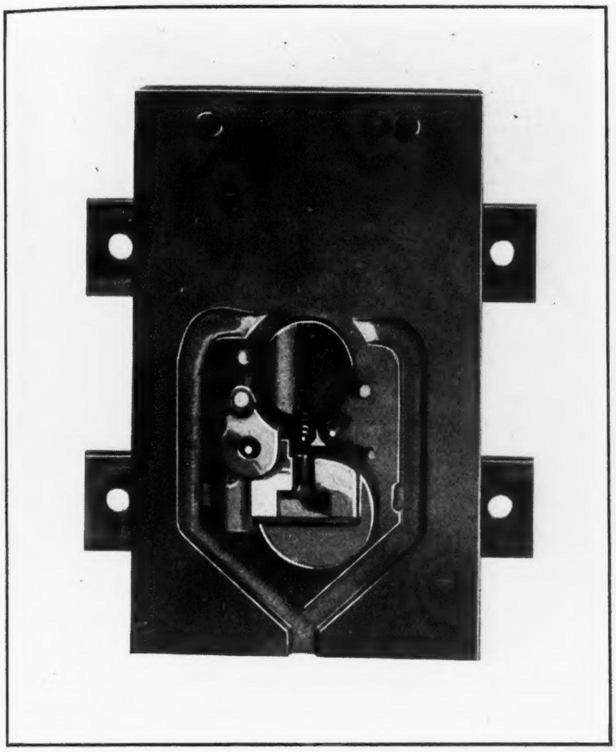


Fig. 8. Construction of the Stationary Die

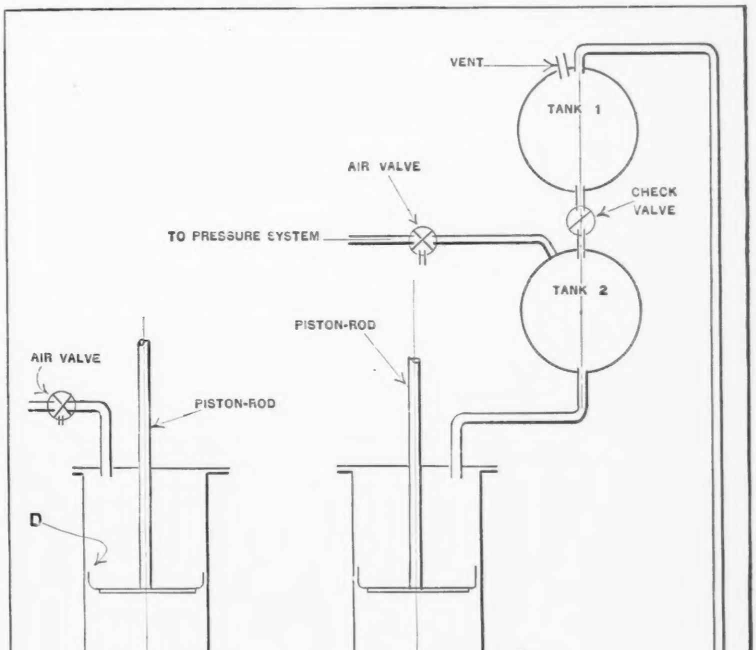
OIL SEAL FOR PNEUMATIC CYLINDER

By BURT E. HOOVER

A rather novel method of eliminating trouble from the leakage of compressed air past the piston packing in a hoisting cylinder is shown diagrammatically in the illustration at *B*. At *A* is shown the previous arrangement. The air was admitted to cylinder *C* by the air valve, forcing the piston downward. The piston indirectly raised a load which was held in one position for a long time. Because of the intermittent operation, the cup leather *D* became dry, and its edges became rough and turned in, allowing the air to leak past the piston.

To overcome this trouble, the arrangement shown at *B* was tried, with successful results. The cylinder, piston, and packing are the same as at *A*, but instead of introducing air directly against the piston, it is admitted into tank No. 2, which is filled with oil. The lower part of this tank is piped to the top of the cylinder, allowing the oil to pass into the cylinder under the pressure of the air and force the piston downward. Thus, by introducing oil instead of air against the piston, the cup leather is kept in a pliable condition, and the oil acts as an effectual seal against the leakage of air.

The oil that escapes past the cup leather in time will fill the space below the piston, and when, through the action described, the piston moves downward, this oil will be forced up through pipe *F* and into tank No. 1. Both tanks are connected by a pipe in which is installed a check valve. When the air pressure in the lower tank is relieved, this check valve opens automatically and allows the oil from tank No. 1 to flow into tank No. 2 to be used once more in forcing the piston downward. The changes shown at *B* were made at a cost of about $100.

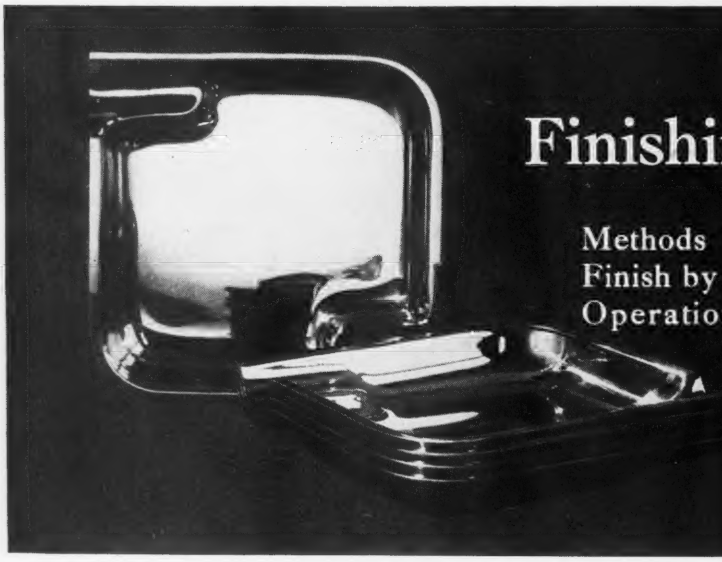


Diagrams Showing how Oil is Used to Prevent Air Leakage Past the Piston Packing

* * *

DIESEL ENGINES FOR TRUCKS AND BUSES

The light-weight Diesel engine is a comparatively new development. In a paper presented before the annual meeting of the Society of Automotive Engineers, O. D. Treiber, president of the Treiber Diesel Engine Corporation of Camden, N. J., pointed out that marine and stationary units were the only Diesel engines made until a short time ago. Heavy engines of slow speed were required for marine purposes for reasons of propeller efficiency, and stationary engines also had to be heavy. Naval requirements reduced the weight, but only in engines that were too expensive for commercial use. Recently, however, light-weight engines have been developed. These must run at high speeds and be built from high-strength materials to withstand the heavy stresses. The light-weight engine must also be so designed that it develops a high mean effective pressure. With equal mean effective pressures, Diesel engines can now be built for motor coach and motor truck service that are only about 15 per cent heavier than corresponding gasoline engines; hence it is perfectly feasible to use the Diesel engine for automotive purposes.



Finishing Stainless Steel

Methods Used for Obtaining a Mirror Finish by Applying Polishing and Buffing Operations in the Correct Sequence

By JACK PEARSALL
Hanson-Van Winkle-Munning Co., Matawan, N. J.

"STAINLESS Steel" and "Rustless Iron" are trade names for typical alloy steels made with a high percentage of chromium. These alloys are made with various proportions of chromium, and many of them with the addition of other metals, such as nickel and copper. Each particular alloy has definite working characteristics, according to its analysis and its treatment in the process of manufacture. These alloys have the property of resisting corrosion in varying degrees, and some of them may be finished to a luster and appearance simulating the familiar chrome-plate finish which has attained such popularity during the last few years.

Stainless steels are brought to a mirror finish by applying polishing and buffing operations of the right kind, order, and number, and with the proper care. The stainless steel ash trays shown in the heading illustration were manufactured and brought to a mirror finish in the plant of the Transue & Williams Steel Forging Corporation, Alliance, Ohio, where many of the experiments leading to the establishment of the procedure to be described in the following paragraphs were undertaken by the author.

When difficulties are met with, they are largely due to a lack of appreciation of the nature of the material, and hence of the processing necessary to obtain satisfactory results. Stainless steels are hard and tough to an unusual degree. The finishing steps in polishing, therefore, must be carefully carried out to insure success.

Fig. 1. Author of Article Polishing a Stainless Steel Cooking Utensil—One of the Earlier Steps in the Work of Finishing

Fig. 2. Covering the Stainless Steel with a Mixture of Oil and Abrasive, Preparatory to the "Bobbing" Operation

Methods Used in Polishing Cold-rolled Steel are not Applicable to Stainless Steel

Some shops seem to have the idea that stainless steels can be brought to a mirror finish in the same three or four steps that will give ordinary cold-rolled carbon steel a finish suitable for electroplating. This is incorrect, for the finish suitable as a preparation for plating is in no way comparable with a mirror finish. Furthermore, to get the same degree of finish, it is natural to expect that more work would be required on stainless steel than on cold-rolled steel.

Other shops, although not quite so optimistic, believe the amount of polishing and buffing work needed to produce a mirror finish on stainless steels should compare favorably with the total amount required for obtaining a similar finish on chromium-plated cold-rolled steel. Even if the work on the chromium-plated steel includes the preparatory polishing of the base steel and possibly copper and nickel buffing operations (which are quite usual in chromium-plated goods), still an equivalent finish on stainless steel requires more work.

There are no discovered short cuts for attaining a mirror finish on stainless steels. To get the result, the necessary work must be done. To obtain lower costs, the manner and sequence of the various operations must be studied. The number of polishing operations necessary to prepare stainless steel for the buffing operation that brings out the final luster depends on the condition of the metal when received from the mill, on the treatment to which it will be subjected in fabrication, as well as on the particular kind of steel used. At this point it is well to emphasize that the steels we are considering are alloys in various combinations, each having its own particular degree of hardness and toughness.

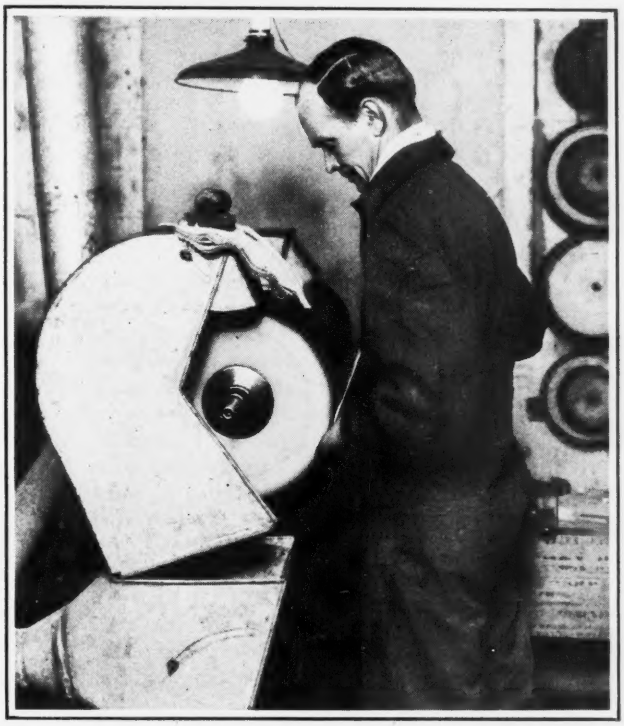


Fig. 3. Buffing for Color with Stainless Steel Rouge, the Final Operation in Obtaining a Mirror Finish

Procedure in Polishing the Average Grade of Stainless Steel

Assuming that the metal is of a rolled stock with normal imperfections, such as pits, etching, or die marks, the procedure required to obtain a mirror finish will be as follows:

The first operation is a "roughing" operation to remove all blemishes from the metal surface. A soft-face cloth wheel should be used, coated with an abrasive grain that has been found correct for the particular metal (No. 60 to No. 70). The wheel should run at a surface speed of 6500 to 7500 feet per minute. A 14- to 16-inch diameter wheel, running at 1750 revolutions per minute, will give the right speed. The pressure applied should be just sufficient to make a good contact between the work and wheel. A greater pressure than this will cause excessive heating which will be ruinous to the wheel facing and the work finish. Less pressure will slow up the work.

If surface defects on the metal remain after this first operation, it must be repeated until they are all eliminated. With the abrasive applied on the first operation—the coarsest used in the polishing sequence—the cut is deepest and hence most effective in clearing up the surface. If the blemishes are not removed in the first coarse abrasive step, an abnormal amount of work must be done in succeeding operations or they will appear in the final finish. It is cheapest to clear the surface before proceeding with the second abrasive step.

The second abrasive operation should be performed with a cloth wheel of the same type as used in the first, operating at the same speed. The abrasive coating should be of a grain size about 40 numbers finer than that used on the first step (No. 100 to No. 120). A light application of wheel lubricant (tallow) can be used. Excessive pressure must be avoided. The cut in this operation must cross the previous marks. This reveals quickly to the operator the successful elimination of the previous grain cut; also, if the second cut is parallel to the first, there is a tendency for the finer grain to follow the marks of the coarser cut, instead of cutting down the ridges between the marks, thus slowing up the work.

The third abrasive operation is performed with a cloth wheel of the same type, running at the same speed as on the previous steps. The abrasive set-up is of a still finer grain, No. 150 to No. 200, depending upon the grain size used at the start. The metal should be well lubricated. Again, the previous grain marks should be crossed and no more pressure than needed applied. With the finer abrasive and the lubricant, the cut is slower than with the previous wheels, so care and time must be taken to do a good job.

The fourth step is the final grease wheel polishing operation, and is important to final success. A somewhat softer wheel than that used on previous operations, such as a quilted sheep-skin wheel,

should be used, but run at the same speed as the previous wheels. The set-up should be with No. 200 to No. 220 abrasive, depending upon the initial grain size used. The grain marks should cross the marks of the previous steps. The pressure should be held within control. Plenty of lubrication should be used to aid in obtaining the required luster. Ample time should be given to this step.

The fifth step is an operation to prepare the polished surface for the final buffing. It can be done either with a Tampico brush wheel revolving at a surface speed of approximately 7000 feet per minute, using a fine flour emery paste or cake with the addition of a little crocus; or what is commonly called a "bobbing" operation can be applied. The latter method, which is preferable, consists of mixing a No. 220 grain abrasive with any grade of machine oil to a rather heavy consistency, using a bullneck, walrus, or sheepskin wheel for the operation. These wheels are used without abrasive coating. The work is "smeared" with the oil and abrasive mixture (see Fig. 2) and processed under the wheel in a circular motion. Plenty of the mixture should be applied, so that there will always be some between the wheel and the metal. It is often desirable, on the "tougher" jobs, to follow with a soft felt wheel, using the same mixture. The cutlery and silverware trades have applied this bobbing method to stainless steel knives with marked success and at low costs. This leather-and-felt wheel process is actually a burnishing operation—the wheel rolls the abrasive over the metal and smooths out all previous abrasive marks, leaving an ideal surface for buffing.

The final step in obtaining the desired mirror finish is a buffing operation. High buffing surface speeds up to 10,000 feet per minute are permissible. A 14 inch diameter buff, operating at 2800 revolutions per minute, will approximate this surface speed. The buffs should be of high-count sheeting, such as 88/88 or 84/92. For narrow flat surfaces, full spiral sewed buffs, 1/4- or 3/8-inch sewing, will serve. For articles such as pots, pans, skillets, radiator shells, etc., having flat and rounded surfaces. loose, full, disk buff sections are suitable. Stainless steel rouge is the buffing compound to use. The buffing must not be pushed and too dry compositions must be avoided. Both tend to excessive heating, which will destroy the true color of the stainless steel. When overheated, the metal will have a good color while hot, but on cooling will become dull. In other words, overheating at the final stage, as at previous stages, defeats the object of the whole process—the attainment of a mirror finish.

With the polishing and bobbing operations properly performed, the buffing operation can be accomplished without danger of overheating, and with a minimum cost for buffs and compositions, as well as a saving of time.

If any of the operations prior to buffing appear excessively burdensome, it is only necessary to remember that we are dealing with stainless steel—a hard, tough metal. On it we expect to accomplish by buff action the same result as on soft non-ferrous metals, such as brass and copper. The result is simply not attainable unless the surface, when brought to the buffing stage, has practically a perfect finish, and even then final success cannot be expected unless a high-count sheeting buff is used, as well as the right buffing composition, applied in the right way.

In the polishing of the softer metals, it took years to arrive at low cost and high quality finishes on a quantity production basis. It is not reasonable to suppose that present costs of producing mirror finishes on stainless steels will apply a few months from now. As for the softer metals, the selection of the right buff and the right composition for each operation is the paramount issue. Manufacturers of stainless steel, users of their product, and manufacturers of polishing equipment and supplies are all working on this problem; and they are bound from time to time to discover new economies in the finishing of stainless steels.

Bonus System for the Tool-room

How often do we hear it said, "You cannot apply a bonus system to tool-room work. It is all right on production work, but it does not apply to the tool-room." And yet, one of the large manufacturing companies in New England has been successfully employing a bonus system in the tool-room for over six years. Under this system, the average earnings of the toolmakers have been increased approximately 20 per cent, and production, with the same number of toolmakers, has increased at least 30 per cent. A fairly fast toolmaker averages about 30 per cent over his regular day rate. How this bonus system was applied will be described in an article by William C. Betz in August MACHINERY. Every works manager, superintendent, and tool-room foreman will undoubtedly be interested in reading this article.

* * *

WELDED PIPE LINES

Last year there was a marked tendency toward the construction of long pipe lines by the electric arc welding method. An example of this is mentioned by L. S. Thurston, of the General Electric Co., in a review of electric arc welding developments during 1929. He speaks of a pipe line built from Jal, New Mexico, to El Paso, Texas. This line is 16 inches in diameter and was arc welded electrically for its entire length. Twenty-seven gas-engine-driven welding equipments were used, some mounted on Fordson tractors and driven by the tractor engines, and others mounted on trucks and trailers. The pipe, in 30-foot sections, was first strung along the cleared right of way. Then seven of these 30-foot lengths were lined up, making a section 210 feet long. One welding crew fixed the sections temporarily in position by tack welding, and another completed the welds. After the 210-foot sections were completed, another crew lined them up with the completed pipe line and welded the pipe in place. Each operator was able to make approximately thirteen welded joints in ten hours.

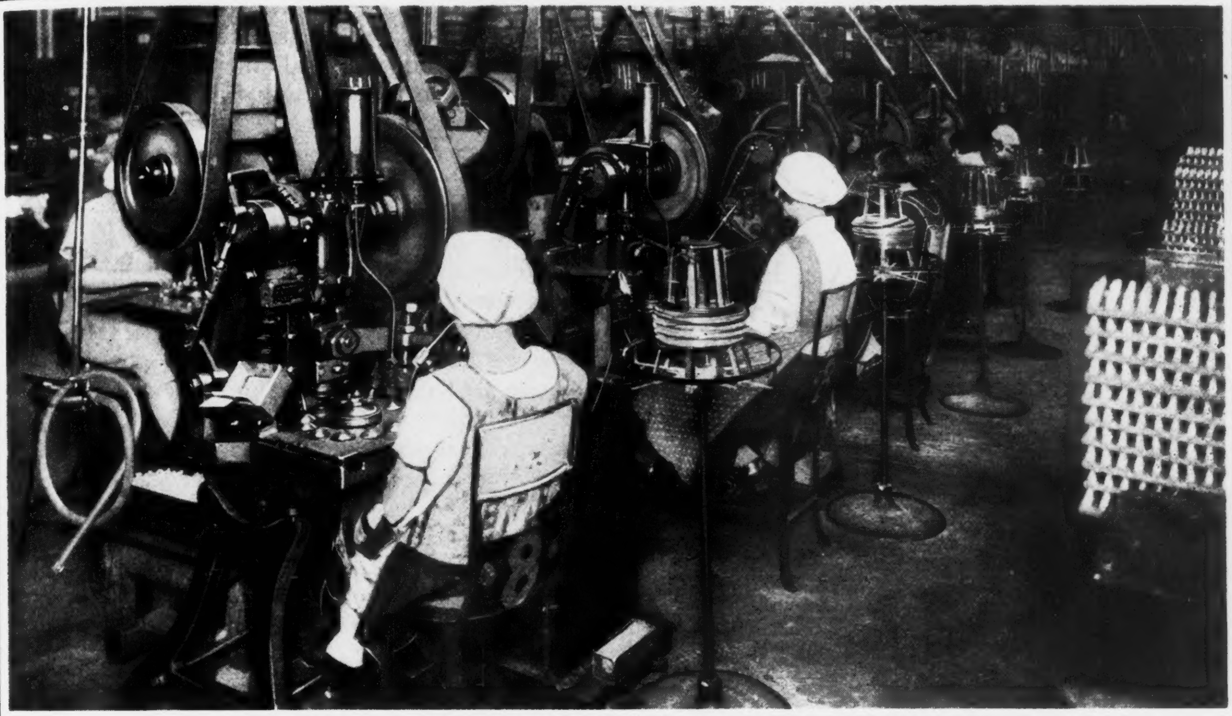


Fig. 1. Battery of Punch Presses that Assemble Small Lubricator Fittings at Unusually High Rates of Speed

Assembling 4440 Fittings Per Hour

Automatic Equipment Used for Assembling Balls and Springs into Lubricator Fittings at High Speed, without Hand Operations

INGENIOUS means are employed by the Alemite Corporation, Chicago, Ill., for assembling lubricator fittings at high speed. Two examples of the class of work handled are shown diagrammatically in Fig. 2. Into each fitting proper, a ball and spring are inserted and locked in place. This is all accomplished automatically without the machine attendant touching any part. Fig. 2 shows the parts approximately twice their actual size.

Punch Presses Used for Assembling Operations

Ball *A* and spring *B* of example *Y*, Fig. 2, are locked in place by four small prongs *C*. The assembling of the ball and spring and the staking of the prongs are accomplished in small punch presses arranged as shown in Fig. 3. Each press is equipped with an index-plate *A*, which is provided with twelve bushings or sockets *B* and is rotated in a clockwise direction as viewed from above.

The assembling operation begins as each bushing is indexed into position *C;* at this point, the tube leading from the overhead hopper *D* drops a fitting into the bushing. When the fitting has been indexed into the next position, a ball from can *E* rolls down the tube directly beneath the can and drops into the fitting. The latter is then carried beneath ram *F*, which pushes the ball down into place. Next, the fitting is indexed beneath tube *G*, where a small coil spring produced automatically by the mechanism at *H* drops into it.

The indexing movements of plate *A* and the forming and cutting off of the small coil springs are controlled by the crankshaft of the punch press, while the feeding of the different parts into the bushings of plate *A* and the operation of the plunger that pushes the balls into the fittings are governed directly by the ram of the press.

As each fitting is indexed away from tube *G* no operation is performed until it reaches the position directly beneath the press ram. Here a punch enters the fitting and stakes the four prongs *C*, Fig. 2, to hold the ball and spring in place. Upon the return stroke of the ram, the assembled unit sticks to the punch until it is stripped off by plate *J*, Fig. 3. Then, as the unit drops, it falls into a small bucket in back of stripper *J*, which rocks to and fro beneath the punch. This bucket discharges the assembled unit through a chute into a tote box.

By the use of machines of this type, 4440 fittings are assembled per hour (approximately 75 per minute). Fig. 1 shows a battery of these machines. Some are arranged for assembling two fittings at a time at production rates even higher than those cited, and on some presses compressed air is employed for blowing the units into a chute as they are stripped from the punch. At the time that the

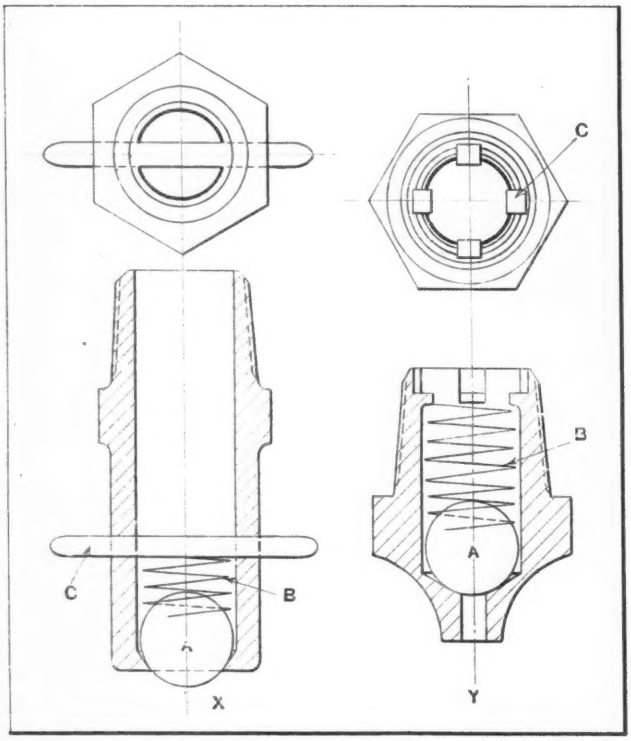


Fig. 2. Diagrams Showing how the Ball and Spring are Locked in Place in Two Typical Lubricator Fittings

photograph reproduced in Fig. 3 was taken, the plant oiler was engaged in lubricating various bearings of the press with an Alemite compressor.

Assembling, Drilling, and Inserting a Pin in Lubricator Fittings

Fittings of the type illustrated at *X*, Fig. 2, are assembled in special machines such as that shown in Fig. 4. These machines are equipped with a large indexing table *A* provided with studs over which the fittings are slipped automatically. The table is actuated by a Geneva movement. As each work-holding stud is indexed beneath tube *B*, a fitting, fed through wire tube *C* from an overhead hopper, drops over it. When this fitting is indexed into the next position, a hole is drilled through it crosswise, by means of the drilling unit *D*, to receive pin *C*, Fig. 2. The hole is held to 0.1225 inch plus or minus 0.0005 inch.

When the fitting has been indexed into position beneath sleeve *E* on the opposite side of the machine, a ball passing through the wire tube *F* from an overhead source is assembled to it, and at position *G* a small coil spring, produced by a mechanism similar to that seen in Fig. 3, is added to it. From this point, the fittings are successively indexed into four positions at the front of the machine, during which period the operator inspects them to make sure that balls or springs are not missing. Then, as each fitting reaches position *H*, plunger *J* pushes the ball and spring to the bottom of the fitting and holds them there, while a mechanism within block *K* assembles pin *C*, Fig. 2, to lock the spindle and ball in place. These assembling pins are fed through tube *L*, Fig. 4.

In the next and final position, two slender fingers attached to a vertical plunger are pushed into the fitting from the top. They expand automatically within the fitting and thus withdraw it from the indexing plate upon the return stroke of the plunger. As this stroke is completed, the fingers again contract and the assembled fitting drops off, falling into a small bucket that rocks back and forth beneath the fingers in the same manner as the one shown in Fig. 3. This bucket also empties the assembled unit into a chute leading to a tote box. Air is supplied through the pipe *M* to blow away the chips that are produced in drilling the pin-hole.

The operation just described is performed at the rate of 55 completed fittings per minute or 3300 per hour.

* * *

The belief that, because of the great number of ships sunk during the war, it would take the world many years to catch up to the size of the former merchant marine proved entirely unfounded. The gross tonnage of seagoing ships in the world in 1914 was 42,500,000; in 1929 it was close to 63,000,000.

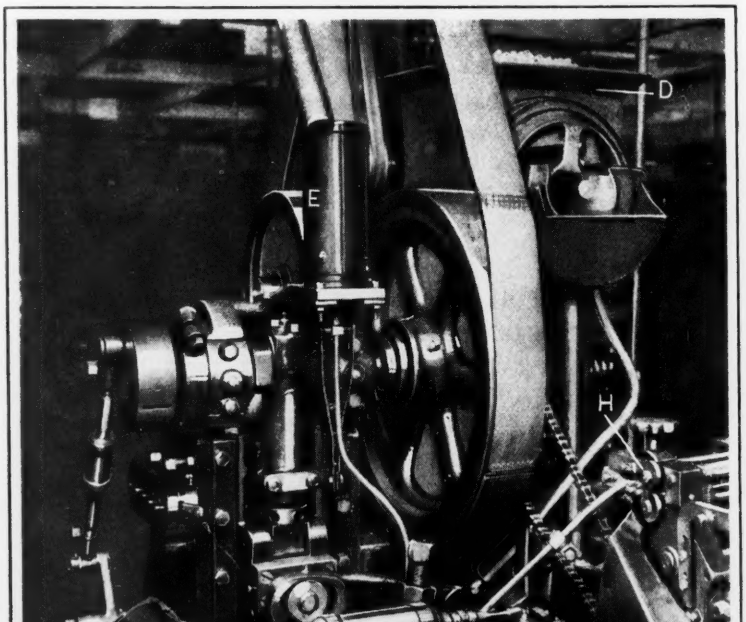


Fig. 3. Punch Press Provided with Special Equipment for Assembling and Staking 4440 Small Fittings per Hour

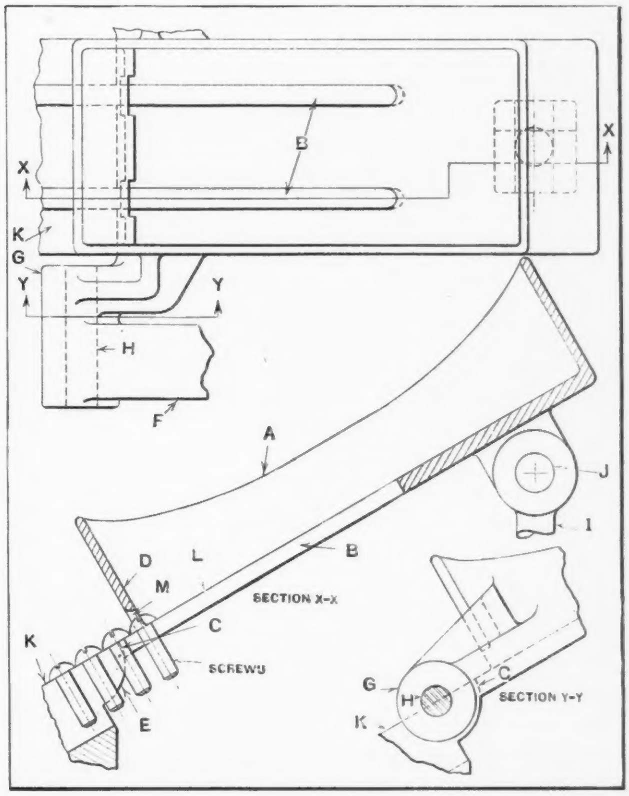
SCREW HOPPER WITH DOUBLE CHUTE

By J. E. FENNO

A hopper of simple design with a double chute for feeding two separate lines of screws is shown in the accompanying illustration. This type of hopper may also be used for feeding rivets, nails, and other parts of a similar shape. It may be made with any number of chutes.

The hopper body *A* oscillates about the pins *H*, which are a running fit in the trunnions *G*, cast integral with the hopper, and a drive fit in the arm *F*, fastened to the machine frame. The oscillating movement is imparted by a cam (not shown) through the rod *I* pivoted on the pin *J*. The latter is a drive fit in the forked boss cast on the hopper body. The double chute *K* is stationary, the top end being machined to an arc concentric with the pins *H*, so as to form a closed joint at *C* at any position of the oscillating hopper. When the latter is at its highest position, as shown, the surface *L* is flush with the top of the chute *K*, which allows the screw to slide easily past the joint *C*.

In operation, the screws are placed in the hopper body *A* and as the latter oscillates, the screws move from one end to the other, some dropping into the grooves *B*. As the grooves are smaller than the diameters of the screw heads, the screws will assume the positions shown, and when the hopper reaches its highest position, will slide down the incline and into the chute *K*, from which they are delivered to the machine. The baffle *D* has two openings *M* in it, just large enough to allow the screws to pass when they are in the position shown.



Hopper of Simple Design for Feeding Screws through More than One Chute

For the best results with hoppers of this type, the supply of screws should not cover more than one-third the area of the bottom of the hopper when the latter is in either extreme position.

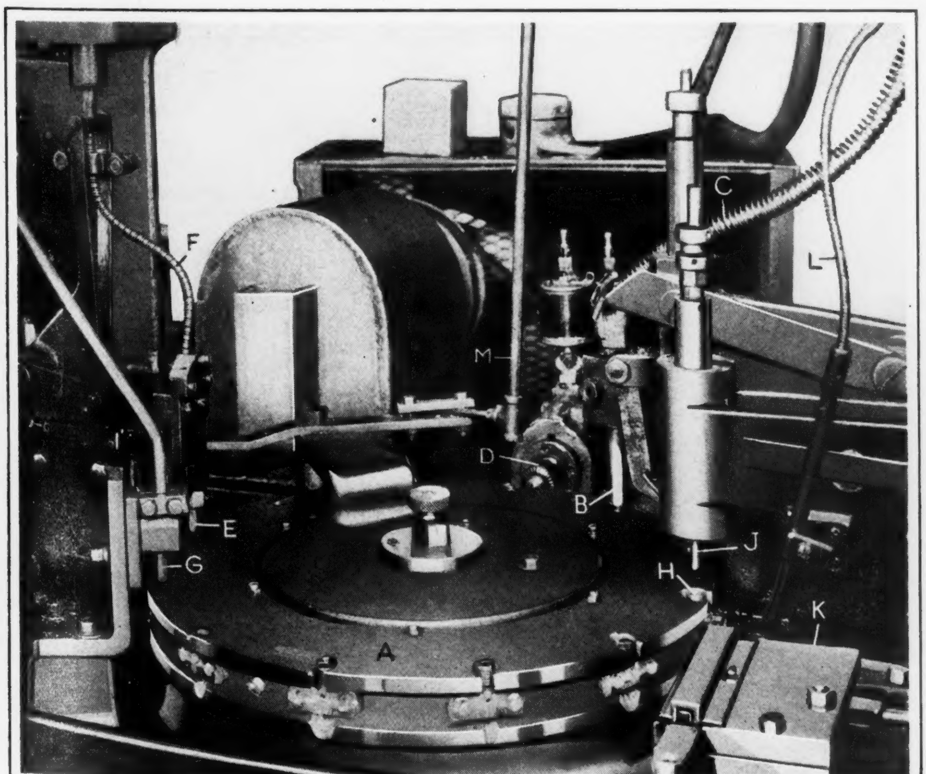


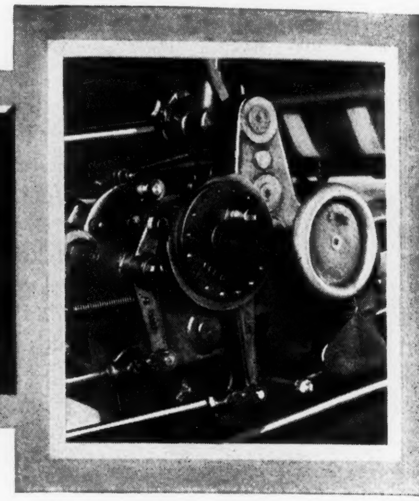
Fig. 4. Special Machine which not only Assembles Balls and Springs into Fittings, but Also Cross-drills them and Inserts Locking Pins into the Drilled Holes

* * *

DIESEL ENGINES FOR AUTOMOBILES

The application of the Diesel engine to automobiles has given rise to many interesting and unusual problems, and has had some very astonishing results. C. L. Cummins of the Cummins Engine Co., Columbus, Ind., presented a paper before the Society of Automotive Engineers at the semi-annual meeting at French Lick, Ind., in which he recorded the results of experiments made with automobiles provided with Diesel engines. In this paper, a number of difficulties met with are explained in detail, and numerous illustrations show constructional features. Copies of the paper may be obtained from the Society, 29 W. 39th St., New York City.

Ingenious Mechanical Movements



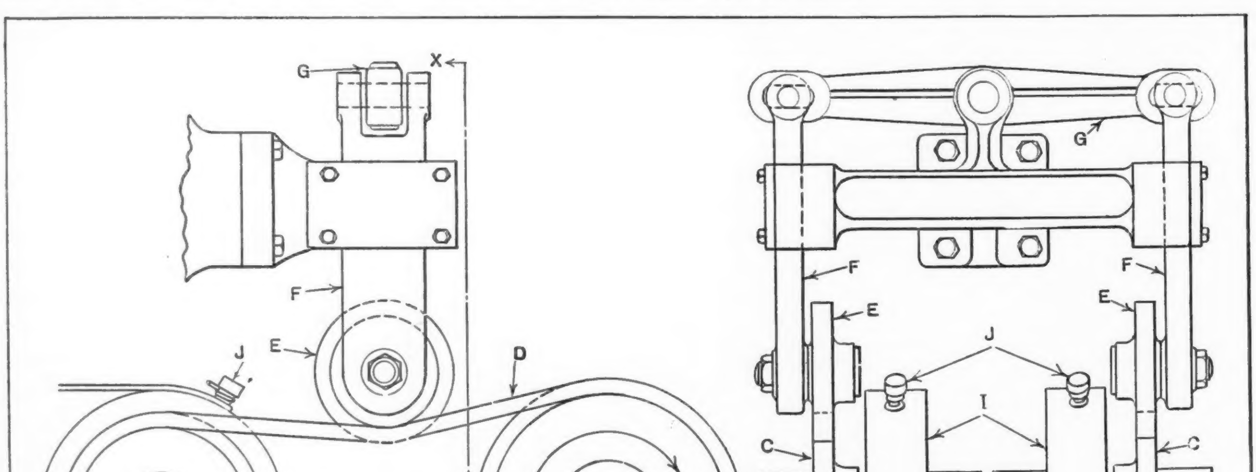
AUTOMATIC WIRE-TENSION EQUALIZER

By R. H. KASPER

On a special machine for producing a wire product, numerous strands of wire are woven or interlaced around two lengthwise strands. After the required number of interlacings have been made, the two lengthwise strands are pulled tightly and the whole locked together. It is essential, however, that both lengthwise strands have the same degree of tension during this locking action. Hand methods of tensioning had been used until the attachment shown in the illustration was developed. This attachment automatically maintains an equal tension on the two wires.

The two sprockets *A* fastened on the driving shaft *B* drive the two sprockets *C* by means of the chains *D*, which have considerable slack. This slack, because of the direction of the drive, will be normally at the bottom. A uniform tension is maintained in the wires by means of the two idler sprockets *E* carried on slides *F*, which, in turn, are connected by the equalizing lever *G*. Sprockets *C* and drums *I* are fastened on the short jack-shafts *H*. The lengthwise strands of wire are fastened to studs *J* on drums *I*.

When the wires are ready for tensioning, shaft *B* is given a slow rotary motion in the direction of the arrow. This motion is transmitted to the sprockets *A* and *C* and the drums *I* through the chains *D*. The idler sprockets *E* operate on the tight or load-carrying side of the chains *D*. Therefore, any increase in the tension of the wires will produce a corresponding increase in the tension of the chains *D*, and also in the pressure against the idler sprockets *E*.



Device in which the Slack in Two Sprocket Chains Equalizes the Tension in Two Wires being Stretched

As long as the tension of the two chains D remains equal, the lever G will be inactive. However, as soon as this tension becomes unequal, the sprocket E on the chain having the greatest tension will be forced upward, causing the lever G to force the other sprocket E downward until the tension again becomes the same in both chains. Except at the very beginning of the tensioning operation, this attachment scarcely seems to operate. The slightest difference in the tension of the two wires is transmitted to the chains and idler sprockets, causing an almost imperceptible equalizing movement of the lever G.

* * *

SELECTIVE AND PROGRESSIVE CONSTANT-MESH TRANSMISSION

By ARTHUR W. HARRIS

Many attempts have been made to improve the variable-speed transmissions of automobiles, as indicated by the fact that over 4000 patents have been granted. The transmission to be described has been designed to provide a simple, direct control. All the speed changes (four with this particular design, including the reverse) are controlled by a straight backward and forward movement of the control lever. Fig. 1 illustrates the general arrangement of this transmission. Certain improvements, referred to later, have been made, but these do not affect the operating principle.

The driving shaft A from the motor transmits motion to the driven shaft B either directly or through different gear combinations. These gear combinations and resulting changes of speed are controlled by clutch units C and D, each unit containing two clutches. The direct or high-speed drive from engine shaft A to driven shaft B is obtained when A and B are locked together by the engagement of clutch pin E with the driving disk F. If clutch pin G engages driving disk H (pin E being withdrawn), the motion will be transmitted from driving shaft A to driven shaft B through gears J, K, L, and M, the intermediate speed being obtained. If clutch pin S engages gear O (as the illustration shows, and assuming that the other clutch pins are withdrawn), the drive will be through gears J, K, N, and O and the low speed will be obtained. If clutch pin S is withdrawn and clutch pin R engages gear Q, the drive will be through gears J, K, P, an intermediate gear not shown, and gear Q, thus reversing the rotation of shaft B.

The method of controlling the relative positions of the four clutch pins is a novel feature of this mechanism. Within the hollow shaft B there is a rod T which can be shifted in a lengthwise direction by hand control lever U. According to the design illustrated, lever U acts through a shifting rod V and a forked arm engaging a groove in collar W. In a later design, however, the rod V has been eliminated and the control lever acts directly on the shifting collar of rod T. Fig. 2 shows one of the clutch units with the direct-acting control lever.

Referring again to Fig. 1, assume that control lever U and rod V are shifted until the operator

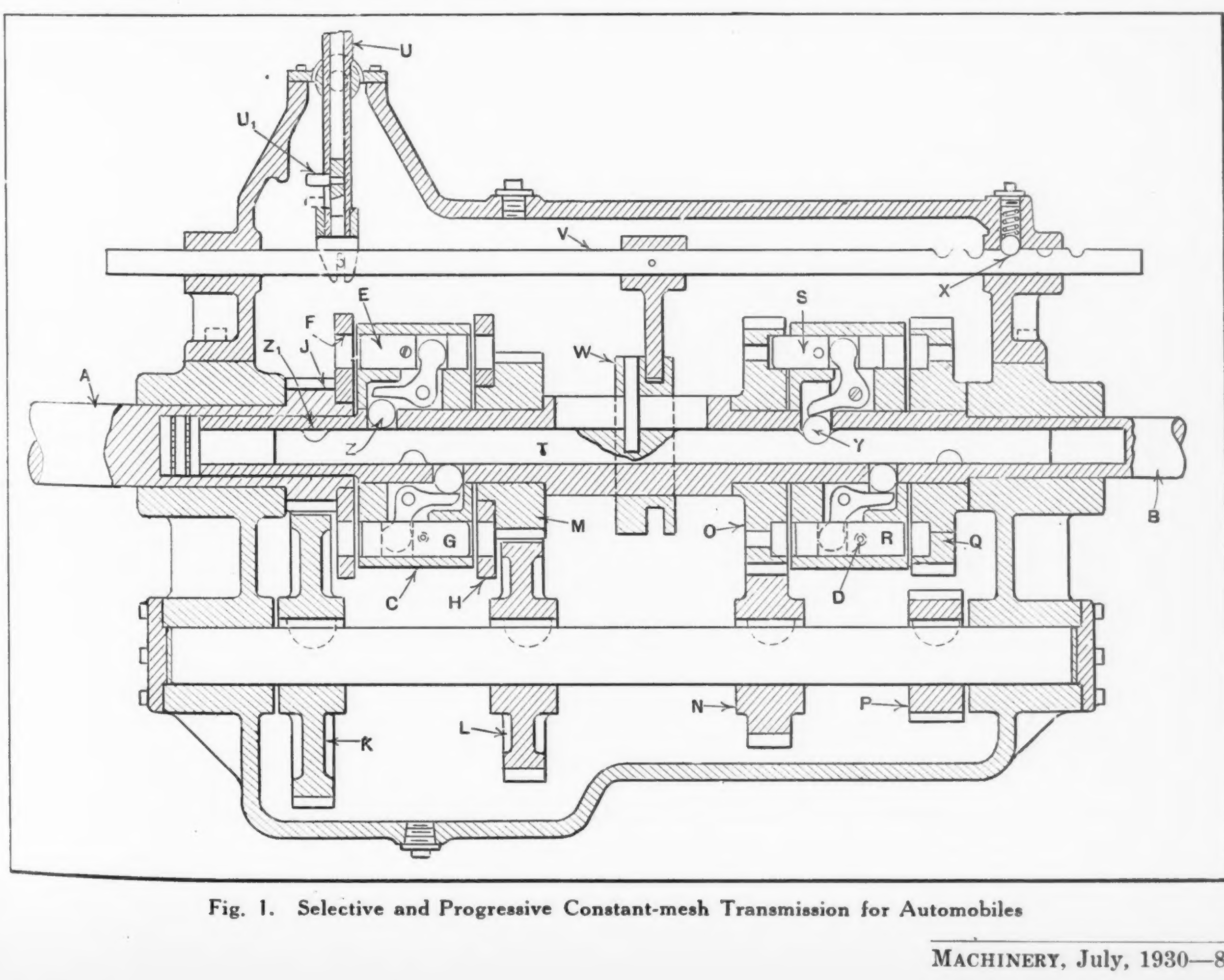


Fig. 1. Selective and Progressive Constant-mesh Transmission for Automobiles

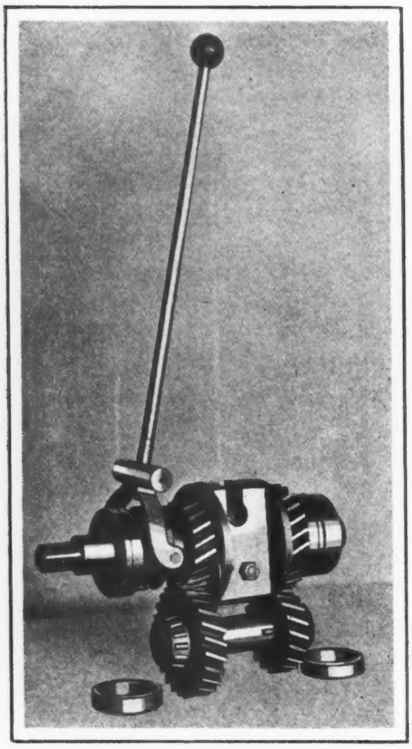


Fig. 2. One Section of a Transmission Equipped with Roller Bearings and a Direct-acting Control Lever

feels that the spring detent X has dropped into engagement with the recess in shaft V, representing the low-speed position; shaft T will now be in the position shown in the illustration. The instant that ball Y drops into its recess in shaft T, clutch pin S is forced by a spring from its central or non-engaging position over to the left, into engagement with one of the eight clutch pin holes in gear O. All of the other clutch pins are held out of engagement by the angular or bell-crank levers shown because none of the other balls are opposite the recesses in shaft T.

If rod T were shifted to the right so that ball Z dropped into pocket Z_1, then the direct or high speed would be obtained, and the other speed changes are controlled in a similar manner. When shaft T is so located that none of the balls is opposite a recess, all clutch pins are disengaged and the transmission is in neutral position. The operator may shift from "high" to neutral without danger of going into reverse, because control lever U is equipped with a stop-pin U_1 which must be lowered to the position indicated by the dotted line before rod T can be shifted to the reverse position. This lowering of stop-pin U_1 is done merely by pushing down on the ball-shaped handle at the top of the control lever.

It will be noted that the clutch pins are instantaneously engaged by spring action, which is, of course, much quicker than hand control, whereas these pins are withdrawn by the direct movement of the hand. Another feature is that the clutch pins engage the driving disks or the gears as far as possible from the center of rotation, thus greatly reducing the strain on the parts involved. While this transmission might appear at first glance to be only a modification of the old progressive shift, the action is progressive and, at the same time, selective.

In a preliminary test with the driving shaft making 800 revolutions per minute, the shift from "high" to reverse and back to "high" was made without stopping at any intermediate position. During road tests, this transmission has been shifted from "high" to neutral and after coasting a short distance, back to "high" without using the clutch. In shifting from "high" to "second" on a hill, it is merely necessary to release the accelerator, shift back to "second" and then step on the accelerator again.

This transmission may readily be designed for four or five speeds in addition to reverse, if required. Since the gears are always in mesh, herringbone gears may be used to secure better tooth action and more silent operation than spur gears will give. Fig. 1 shows only plain bearings, but the plan is to use roller bearings. In this preliminary design, Fig. 1, the springs for operating the clutch pins are placed in parallel holes and act against projecting pins at the side. In a later model, the clutch pins are made large enough to carry the spring inside, so that the spring is directly in line with the pin. The different changes referred to both simplify the construction and reduce the manufacturing cost.

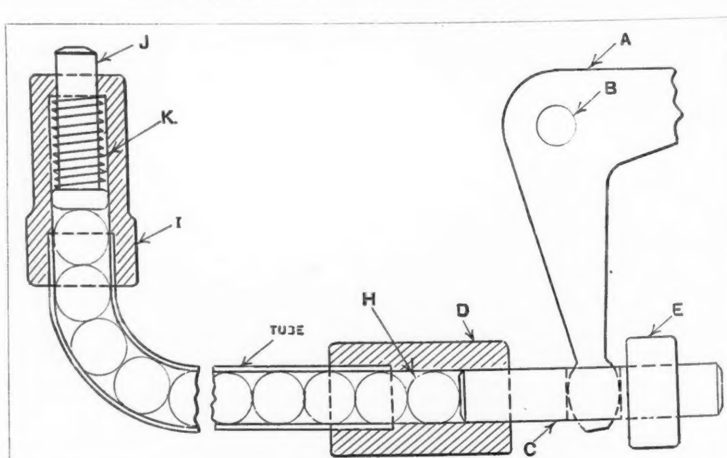
* * *

INDEXING PLUNGER OPERATED BY STEEL BALLS

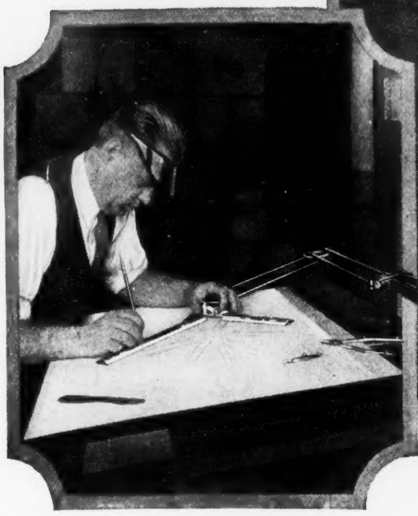
By J. E. FENNO

A rather unusual application of steel balls for transmitting motion to an indexing plunger on a dial press is shown in the illustration. The plunger J slides in the fixed bearing I and receives its motion from the lever A through the steel balls H. The lever oscillates about the fixed stud B, and its lower end engages a slot in the member C. The latter is a sliding fit in the stationary bearings D and E, and as the lever A oscillates, member C forces the balls up the tube, causing the plunger to move upward into the dial.

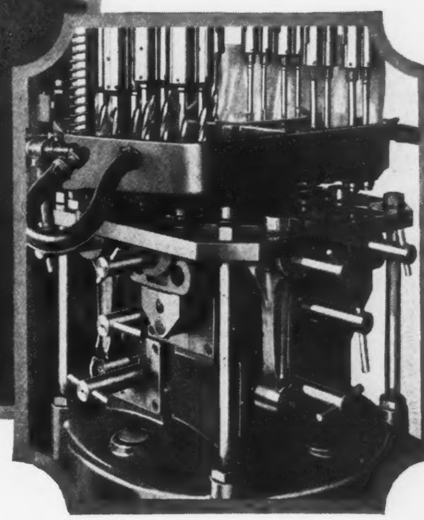
The plunger is returned to the position shown by the coil spring K which also keeps the balls in contact with member C. It is obvious that with this simple device the tube containing the balls may be bent to almost any shape desired, permitting it to clear any member of the machine.



Transmitting Motion to a Plunger with Steel Balls Confined in a Tube



Design of Tools and Fixtures



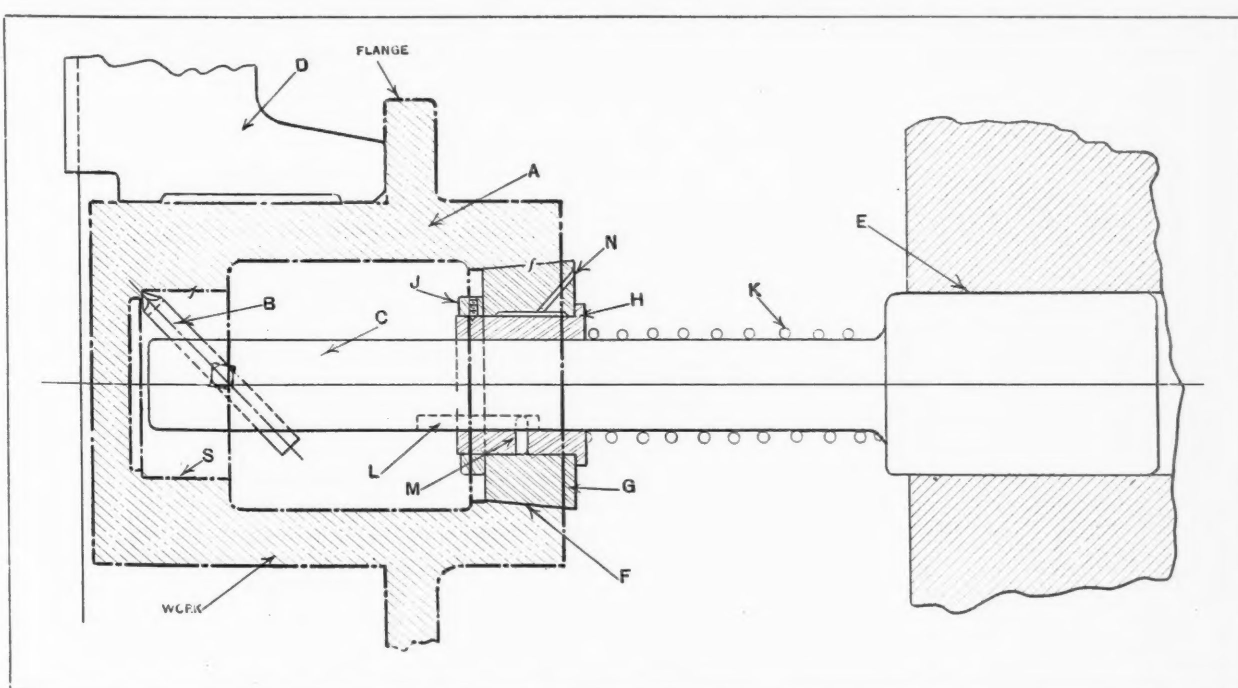
BLIND HOLE BORING-BAR WITH PILOT BUSHING

The boring-bar shown in the accompanying illustration is designed for boring the blind hole *S* in the part *A*. As the blind hole prevents the use of a pilot bushing in the spindle of the machine, provision is made for piloting the bar within the work. The ends of the chuck jaws *D* serve as locating stops for the flange previously machined on the work. Shank *E* of the boring-bar is held in the turret of the machine.

A tapered hole is bored in the outer end of the work at *F* in the operation that precedes the boring of the blind hole at *S*. The tapered hole at *F* is used as a centering seat for the pilot bushing *G*. This bushing turns with the work on the sleeve *H* mounted on the boring-bar. Collar *J* at the inner end of bushing *H* serves to hold the pilot bushing in place.

The illustration shows the boring-bar in the position it occupies at the completion of the boring operation. On the return traverse of the turret, spring *K* keeps the pilot bushing in place until the end of slot *L* comes in contact with pin *M* and prevents further sliding movement of the bar in bushing *H*. The bushing *H*, collar *J*, and pilot bushing *G* are then withdrawn from the work with the boring-bar.

When the turret is fed forward, the pilot bushing *G* becomes firmly seated in the tapered bore at *F* before the boring tool comes in contact with the work. Spring *K* has sufficient strength to hold the pilot bushing in place during the boring operation. An oil-hole at *N* provides means for lubricating the bearing on bushing *H*.



Boring-bar Equipped with Pilot Bushing for Boring Blind Hole

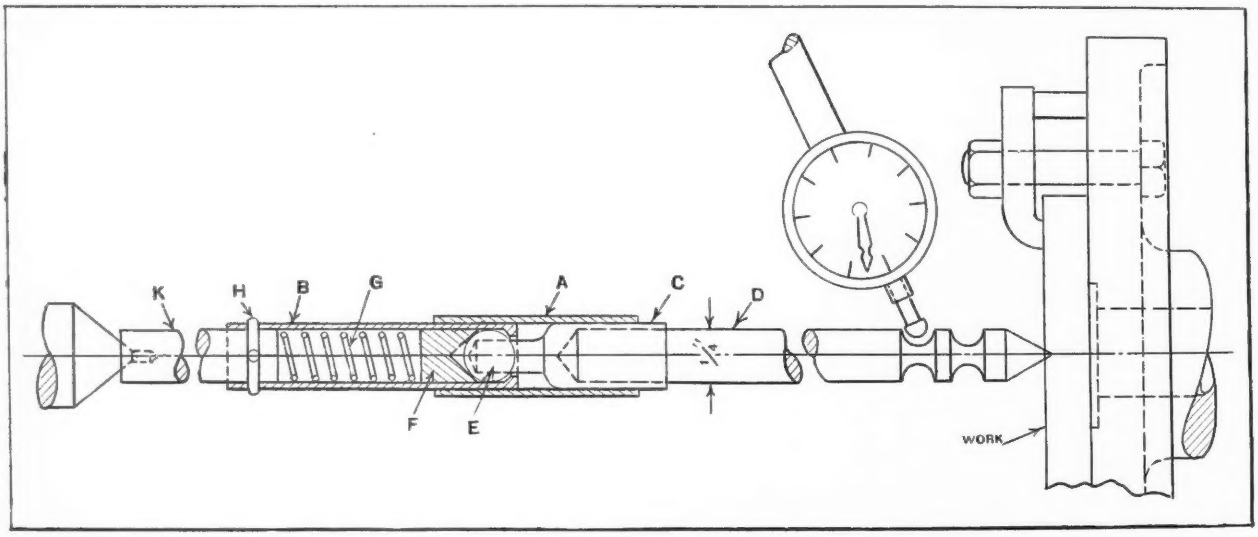
Two boring-bars like the one illustrated are used in machining part *A*, one being used for rough-boring and the other for finish-boring. Thus, the operations performed on the part by tools held in the machine turret include rough-boring and taper-reaming the hole at *F*, followed by rough- and finish-boring the blind hole at *S*, using the tapered hole for piloting the boring-bar. H. M.

WIGGLER FOR TRUING UP WORK

By CHARLES J. HEYELMAN, Cambridge, Mass.

The wiggler shown in the accompanying illustration was designed recently by the writer for use in truing up work on a lathe faceplate. It has proved very satisfactory in use and may be readily constructed by others who desire a tool of this kind. All parts are made of drill rod, with the exception of the spring *G* and the steel ball *E*.

The parts are drilled and reamed to close sliding fits. The outer surface of part *A* is knurled. Parts *E* and *F* and the point of member *D* are hardened. The end of part *C* is made a press fit in the hole in ball *E*, and the rear end of part *D* is a press fit in part *C*. Spring *G* is made of 0.025-inch spring wire, wound to give eight coils per inch.



Wiggler which can be Supported by Tailstock Center or Held in a Chuck

The wiggler can be used in either of two ways. One way is to support the outer end on the tailstock center, as shown in the illustration, and the other way is to grip the shank *K* in a drill chuck held in the tailstock. When used in the latter manner, the sleeve *A* is pushed back on the member *B*, so that the universal ball-and-socket joint is given free play.

In using the wiggler, the point is placed in the punch mark to be trued up after the work has been roughly aligned by eye. The tailstock is advanced to compress the spring *G* just enough to hold the wiggler firmly in place. A dial or other indicator is then mounted in the toolpost and the end brought into contact with one of the grooves in part *D*, using just sufficient pressure to give a positive reading of the indicator. The work is then revolved and trued up until the indicator reading shows no variation or, in other words, indicates that the punch mark is in alignment with the center line of the lathe spindle.

CLIP-FORMING PUNCH WITH MECHANICAL EJECTOR

By A. EYLES, Manchester, England

The press equipment shown diagrammatically in Fig. 2 was designed to produce steel clips such as shown at *D*, Fig. 1. These clips are used for binding together the coil springs of cushions or mattresses for automobiles and railroad passenger cars. The clips are made from No. 20 gage (0.0392 inch) cold-rolled steel strip stock 3/4 inch wide. The steel clips are completely formed to the shape shown at *D* at one stroke of the press.

By equipping the punch or press tools with a mechanical ejecting device and an automatic feeding arrangement, the press can be run automatically at a substantial saving in cost over the former method of bending the parts by hand-operated tools. The occasional replenishing of the strip steel stock on a rotary reel is about all the attention the press requires.

The forming tools were first mounted on a standard, open-back, inclinable press in which compressed air was used to supplement gravity in ejecting the work. This method of ejection did not prove successful, however, as the formed clips had a tendency to cling to the forming punch *E*, Fig. 2. To overcome this trouble, the mechanical ejecting device shown diagrammatically in the view to the right was designed. This very simple device has proved highly successful and, in fact, has made possible the high rates of production now obtained.

When the press is in operation, the steel strip is fed automatically from a rotary reel through the guiding slot in block *F* and then along the spring guide plate *G*. The ram of the press descends, the

shearing blade H cuts off the blank, and, at the same time, the punch E forms the steel blank to a U-shape in the die I. The plunger plate J holds the strip stock securely in the guide plate during the shearing operation. The guide plate G is forced down into the recess directly below it by the plunger plate and the shearing blade.

The springs K on the punch guide pins are sufficiently strong to prevent the punch from being forced back into the recess in the holder during the shearing and forming operation. The ram of the press, on continuing its downward stroke, carries the wedge-shaped plunger L into contact with the sliding block M which forces the side of the steel clip over punch E, thus completing the part. The springs K, being compressed during this operation, allow the guide pins of the forming punch to slide upward into the recess in the punch-holder.

The mechanical ejector consists of an inclined steel guide pin or post N, on which the sliding cross-bar socket O has an upward and downward movement, while the sliding cross-bar simultaneously slides laterally between the guide plates P, Figs. 1 and 2. The striking or ejecting plate Q is secured to the cross-bar R by rivets. On the downward stroke of the press, the cross-bar socket O travels down the inclined guide pin N, causing the ejecting plate Q on the cross-bar R to be drawn outward so that it clears the punch E.

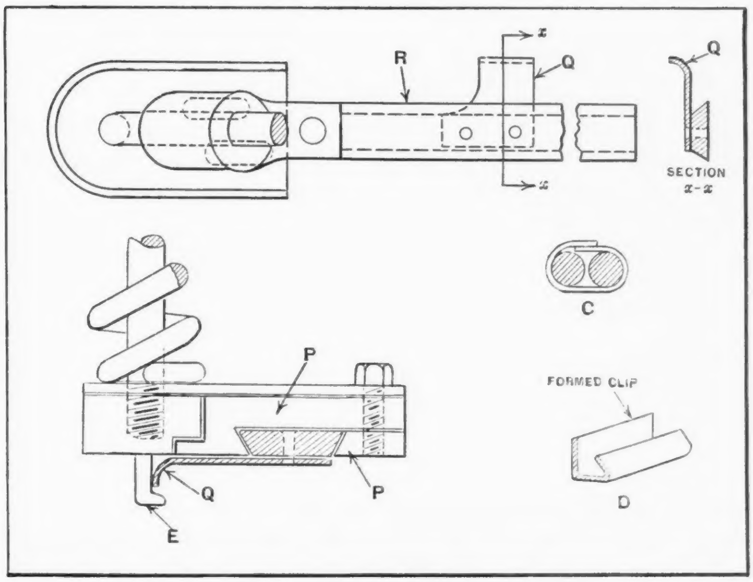


Fig. 1. Formed Metal Clip and Parts of Ejector Used on Forming Punch

On the up stroke of the press, the movement is reversed. The cross-bar R, moving in an upward and inward direction, causes the ejecting plate to pass over the face of the punch E and thus eject the steel clip. At C, Fig. 1, is shown an enlarged section of the steel clip after it has been secured to the coil springs of a mattress by means of tools not shown in the illustrations.

For clearness, the guide pins S, Fig. 2, are not shown in the elevation view to the left. The ram of the press on which the forming tools are used operates continuously at a speed of 100 strokes per minute, which gives a production of 6000 steel clips per hour.

MACHINING INTERNAL AND EXTERNAL TAPERS SIMULTANEOUSLY

By A. R. KLING, Plainfield, N. J.

The cast-iron drum shown by the heavy dot-and-dash lines in the accompanying illustration has the outer surface of the rim turned to a taper of 15 degrees and the inner surface bored to a taper of 7 degrees. These surfaces are not required to be held within close limits on their diameters, the main purpose of the machining operation being to remove the rough surface of the casting. The finished drum is used on a weaving machine. It actuates two sets of rollers, and was formerly

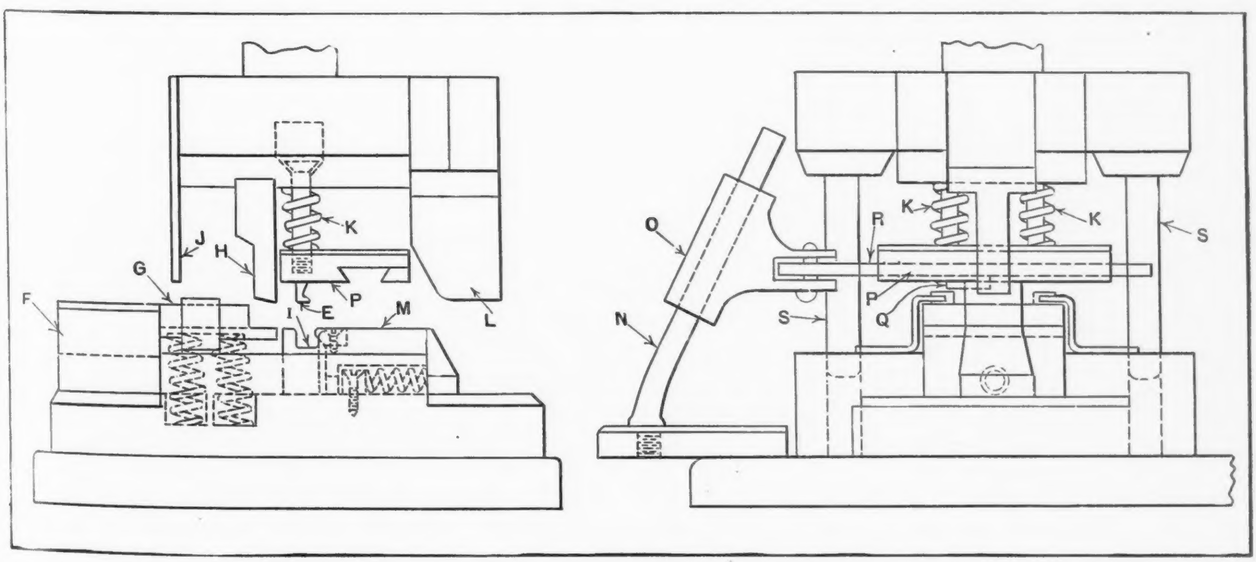


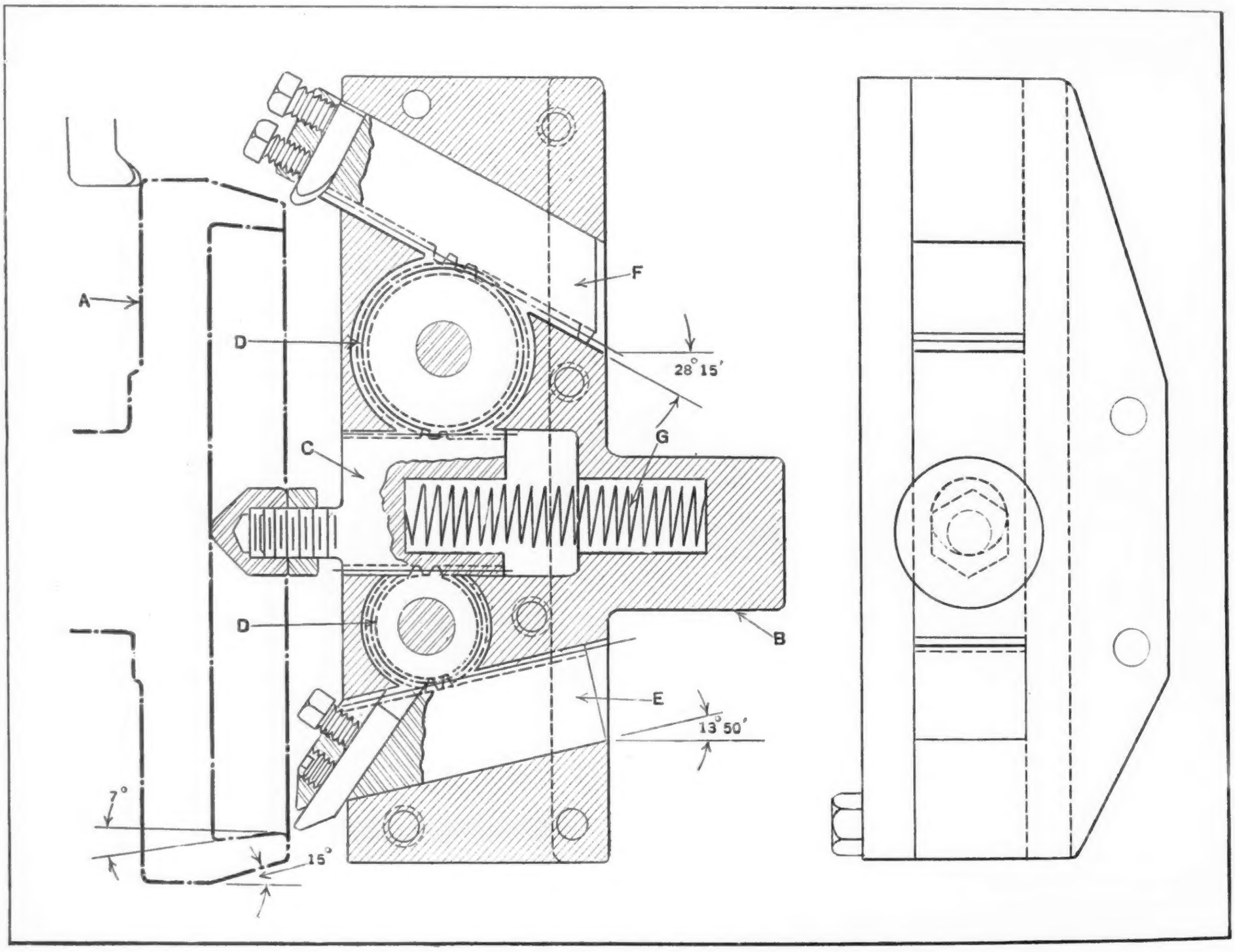
Fig. 2. Clip-forming Die or Punch Equipped with Mechanical Ejector

turned in two operations, using standard lathe attachments. Production demands, however, made it essential to reduce the machining cost, and the turret tool-holder illustrated was designed to accomplish this purpose. The tools in this holder machine both tapers simultaneously, while a cross-slide tool finishes the rear face *A*.

The shank *B* is held in the turret of a Potter and Johnston 6-A automatic. The turret is fed forward until the nose of the double rack *C* strikes the work. The rack then remains stationary while the turret continues to advance. This causes the pinions *D* to revolve and thereby transmit outward feeding movements to racks *E* and *F*. These racks carry the tools that turn the tapered surfaces. It is obvious that, in addition to the outward feeding movement of the racks *E* and *F*, there is also a forward movement of the tool body. The path followed by the point of each tool is, therefore, the result of a compound movement. The rack *F* is positioned at an angle of 28 degrees 15 minutes, and the rack *E* at an angle of 13 degrees 50 minutes with the horizontal axis of the machine spindle. The spring *G* serves to keep the nose of rack *C* in contact with the work when the turret is returned to the starting position.

As a comparatively long cut is required to finish the back face *A*, and as the racks *E* and *F* feed at a rate double that of the turret, a special slow-feed cam was made to provide the feed for the facing tool. No other changes in the machine equipment were required. Through the use of the tool described, a saving of 40 per cent in the machining time was effected.

This tool is not designed for coarse feeds or for machining steep tapers. For the job described, the machine was set to operate on about a 5-minute cycle. The turret feed is approximately 0.0015 inch per revolution of the machine spindle, which is approximately equivalent to a feed of 0.003 inch at the point of the tool. The pieces produced by the tool showed tool marks similar to those left on the work when turned on a lathe equipped with a taper attachment. The finish obtained, however, was satisfactory for this particular job.



Tool for Machining Two Tapers Simultaneously

FIXTURE FOR GRINDING THREAD-CUTTING TOOLS

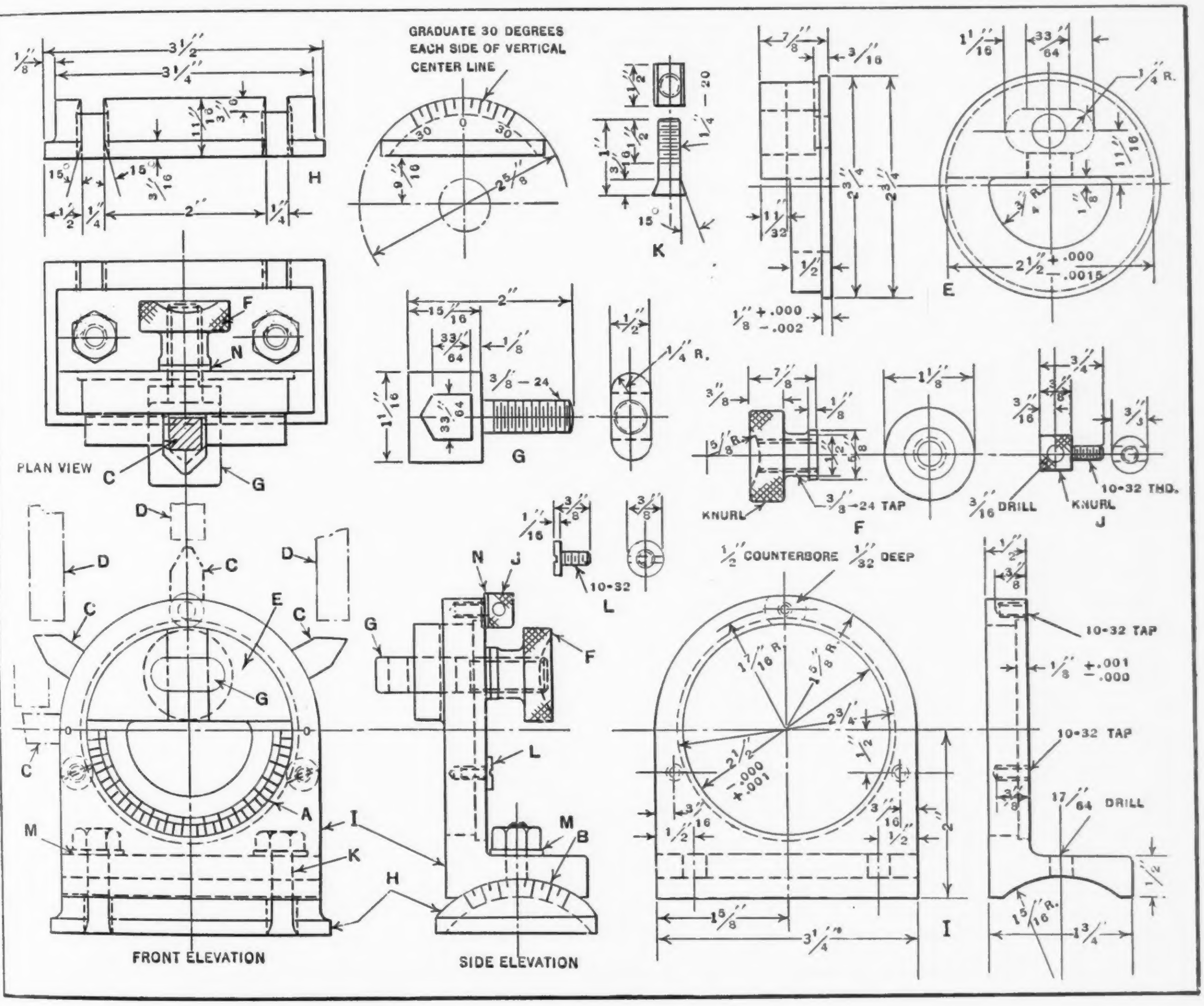
By JOHN G. JERGENS, Cleveland, Ohio

A fixture designed by the writer for grinding various kinds of threading tools is shown by the plan, side, and end assembly views in the accompanying illustration. This fixture is of the universal type, having a holder which can be adjusted to any angle up to 90 degrees each side of the vertical center line, as viewed from the front, and to any

angle up to 30 degrees from the vertical as viewed from the side. The graduations at *A* and *B* are in degrees, and are numbered in the usual way from 0 to 90 degrees. In order to simplify the views, however, the numbers have been omitted in the accompanying illustration, and only every fifth graduation is indicated.

The four different grinding positions for a threading tool that is to cut a 60-degree U. S. standard thread are indicated by the full and dot-and-dash lines *C*. The corresponding positions of the grinding wheel are indicated by the dot-and-dash lines *D*. The tool *C* is securely clamped to the member *E* of the fixture by tightening the knurled-head nut *F* on the clamp *G*. It will be noted that the slot in clamp *G* is made V-shaped at one side, a feature that tends to center the tool. By securing a small plate to member *E*, the fixture can be used as a universal angle-plate for light work.

Detail views of all the important parts are included in the accompanying illustration to enable anyone to readily construct a fixture like the one described. The various detailed parts can be identified in the assembly views by the reference letters. In addition to the detailed parts, two washers *M* and one washer *N* are required. The washers *M* are 1/16 inch thick, have a hole 17/64 inch in diameter, and an outside diameter of 5/8 inch. The washer *N* is 1/16 inch thick, has an outside diameter of 1/2 inch, and a hole 5/32 inch in diameter. The parts *E*, *H*, and *I* are made of cast iron and are finished all over. Parts *G*, *J*, and *K* are cold-rolled steel and are casehardened.



Assembly Views and Details of Fixture Designed for Use in Grinding Threading Tools

* * *

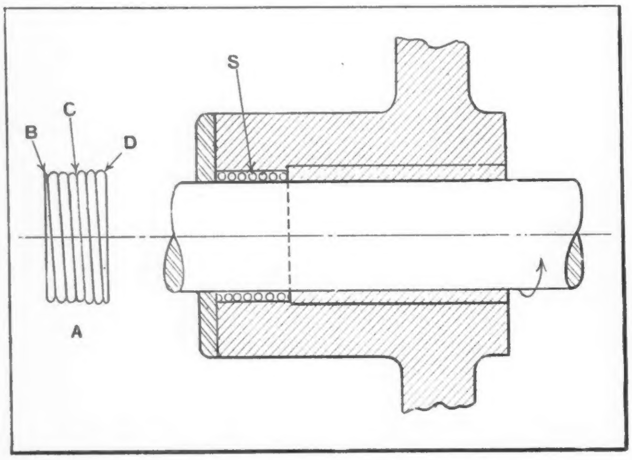
CARNEGIE INSTITUTE WELDING SCHOOL

The Carnegie Institute of Technology now has the largest school for the training of welders of any engineering institution in the country. The classes consist of two groups, one intended to develop skill in welding, and the other to show the prospective engineer the possibilities of welding in his chosen profession.

The night classes in welding have an enrollment of over 250 students. This instruction is intended to impart skill to the student and to give some idea of the reasons for the fusion of metals, penetration, expansion and contraction, etc. The day classes have an enrollment of over 350 students. In these classes special attention is given to structural, aeronautical, pipe, and container welding. The institute gives instruction in all kinds of arc and gas welding.

Ideas for the Shop and Drafting-room

Time- and Labor-saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work



Helical Spring Type Oil Retainer Applied to Bearing

HELICAL SPRING TYPE OIL RETAINER

The provision of a spiral groove in a bearing for the purpose of retaining the oil is a well-known practice. It is also well known that the oil will be forced or drawn out of a bearing so equipped if the shaft is run backward. A device for retaining oil in a bearing with the shaft running in either direction consists of a helical spring wound to two different diameters, as shown at *A* in the accompanying illustration.

In practice, the difference in diameter need be only a few thousandths of an inch. The small portion from *B* to *C*, however, should be a tight fit on the shaft when the spring is mounted in the bearing as shown at *S*. The larger portion from *C* to *D* should be a tight fit in the bearing housing. The space between the shaft and the housing should be barely larger than the diameter of the wire from which the helical spring is made.

If the spring is made as shown, that is, wound right-hand and mounted with the large end toward the bushing in which the shaft runs, the action will be as follows: When the shaft is running in the direction indicated by the arrow, the small end of the spring will grip the shaft and run with it. The outer surface of the spring will then sweep against the surface of the housing, carrying the oil back toward the bushing. If, however, the shaft is run in the opposite direction, the large end of the spring will expand and grip the surface of the housing, causing the spring to remain stationary. The inner surface of the spring will then sweep the oil along the shaft toward the bushing. The direction of the sweeping action may be reversed by winding the spring in the opposite direction or by turning the spring end for end to suit the requirements of any particular installation.

Rochester, N. Y. ERNEST C. ALLEN

SAVING TIME ON DETAIL DRAWINGS

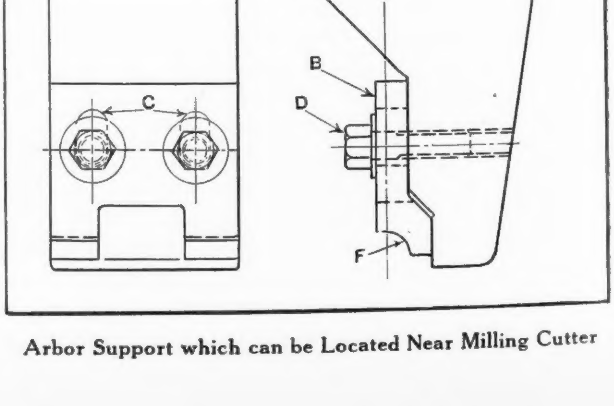
The practice in most drafting-rooms is to detail every part of an assembly except standard stock parts. Some concerns eliminate drawings of simple pieces, such as pins, shafts, keys, springs, etc., because they can be described just as well in the bill of materials as by means of a drawing. Another way of saving time is to show only half of any piece that is symmetrical about a center line and to show only a quarter view of a part that is symmetrical about both the vertical and horizontal center lines. Considerable time has been saved in one plant by adopting this practice. G. A. F.

ARBOR SUPPORT FOR CUTTERS OF SMALL DIAMETER

When cutters of relatively small diameter are used in a milling machine, it is desirable to support the arbor as near the cutters as possible, especially for heavy cuts. The arbor support shown in the illustration is designed with this end in view. It fits on the over-arm of the machine, and can be clamped securely in position by the cap-screws *A*.

The phosphor-bronze plate *B* straddles the cutter, and has elongated slots *C* in it to facilitate adjustment for height and wear. This plate forms a bearing or support for the arbor, and is held in position by cap-screws *D*. The bearing portion *F* is bored to fit the hardened and ground collars on the cutter-arbor.

Toronto, Canada CLIFFORD CORNWALL



Arbor Support which can be Located Near Milling Cutter

LEVELING BLOCK FOR ASSEMBLING FLOOR

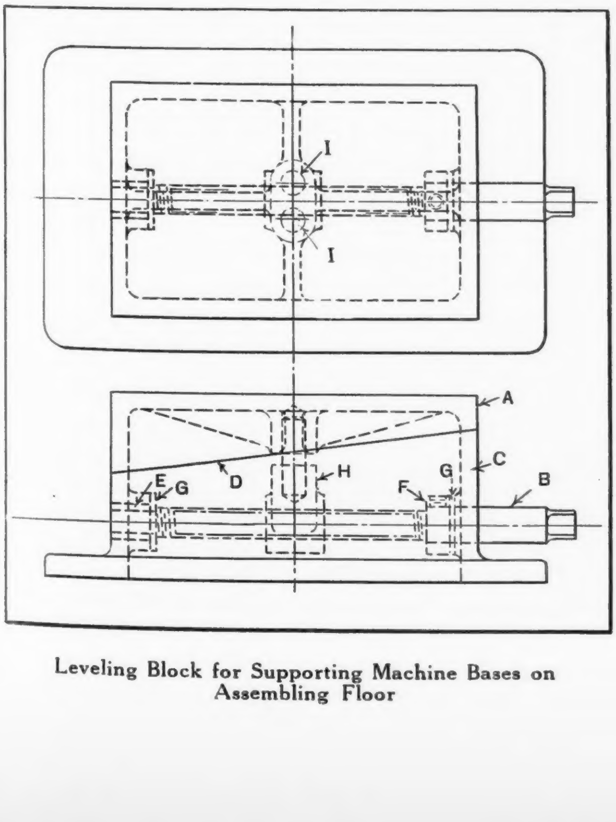
The uneven floors found in the assembly departments of many small machine shops make it necessary to place pieces of cardboard, paper, or some other form of blocking under the base castings of the machines in order to level them for the assembling operations. To eliminate this tedious work and facilitate the assembling, the leveling block shown in the accompanying illustration was devised.

This device is of the sliding wedge type with a screw adjustment for raising or lowering the upper or supporting member *A*. When the screw *B* is turned by means of a wrench, member *A* slides on the base *C* along the inclined surface at *D*. With one of these leveling blocks under each corner of a machine base, it is a simple matter to level the machine and keep it properly supported during the assembling operations.

The screw *B* is mounted in a bushing *E* and a hole in the opposite side of the base. The collar *F* and the shoulder near the end of the screw serve to hold the screw in place. Between the retaining surfaces and the bosses of the base are fiber thrust washers *G*. Assembled on the screw is a threaded member *H* containing two steel fingers *I* which fit into holes in the member *A*. As the upper member *A* of the device is raised 0.005 inch for each complete revolution of screw *B*, it is possible to obtain fine height adjustments of a known amount.

The leveling block described is similar to one that proved very useful in the assembling department of one concern. The principal difference between the two designs is that the screw *B* of the block illustrated is located parallel with the base, whereas in the other block, the screw was located parallel with the inclined surface at *D*. Both designs are satisfactory, but the one shown is simpler to construct.

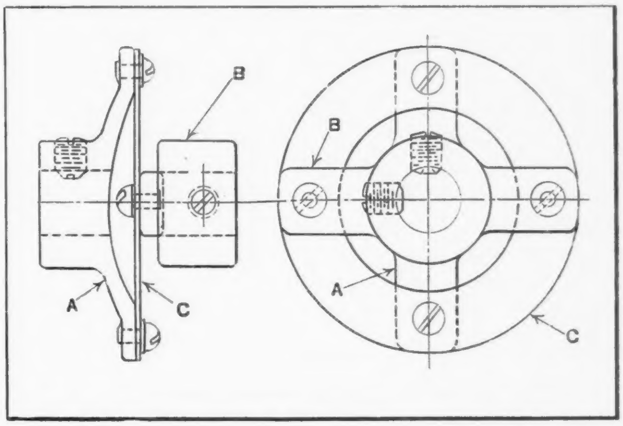
Philadelphia, Pa. GEORGE A. FRIES



Leveling Block for Supporting Machine Bases on Assembling Floor

FLEXIBLE COUPLING FOR SHAFTS

An inexpensive flexible coupling designed to compensate for misalignment of the shafts is shown in the accompanying illustration. This coupling consists primarily of two castings *A* and *B*, which are exactly alike, and the flexible ring *C* made of spring phosphor-bronze. The thickness of this ring depends on the load to be carried. The castings *A* and *B* are fastened to the ring *C* by round-head screws. The four holes in the ring are equally spaced, so that the castings are positioned at right angles to each other.



Flexible Coupling for Small Shafts

New York City JOHN E. MORSE

UNITING BABBITT LINING AND SHELL

After bearings have been rebabbitted, the lining is often hammered in so as to unite it firmly with the shell. This treatment may damage the bearing metal, and furthermore does not unite the lining with the shell effectively. However, satisfactory results may be obtained with the following method.

The bearings are first babbitted from 0.001 to 0.002 inch under size. A mandrel having a taper of about 0.0015 inch is then forced through the bearing with an arbor press. This operation will compress the babbitt and join it more firmly with the shell. A bearing thus treated will have a smooth, hard surface, with excellent wearing qualities. It is also claimed that it is easier to fit the bearing to its shaft.

Brighton, England W. E. WARNER

TREATING CEILINGS OF FORGE SHOPS

In cleaning the ceilings of forge shops, much trouble and expense are caused by the oily soot accumulation. Some of this soot is absorbed by the ceiling in time, whether the latter is constructed of wood or cement tile. If, when the ceiling is new, a good standard grade of filler oil or creosote is applied to a wood ceiling, followed by a coat of oil paint (in the case of a cement tile ceiling, a water glass filler can be used), the soot can be removed readily, thus providing a clean base for the periodical coats of paint. H. C. CHARLES

Questions and Answers

MATERIAL FOR PERMANENT MOLDS

T. W. T.—What material is used for permanent molds for casting aluminum? Are there any special precautions to be observed in making and using these molds?

Answered by A. Eyles, Moston, Manchester, England

Permanent molds for aluminum castings are usually made of a good quality cast iron, although tungsten steel is sometimes recommended. The latter material, however, is more expensive and though it provides a longer life, cast iron will normally be found satisfactory for the quantity of castings generally required. However, tungsten steel is used for cores, since the latter are subjected to higher temperatures. The molds are usually built in sections to facilitate machining and the replacement of worn parts.

The molds are designed so that there is a progressive freezing from the farthest points of the casting gates, the metal in these parts and in the sprues being the last to solidify. If this does not occur, there are likely to be cavities on the surfaces that solidify last or porosity may occur if the mold is too cold. Also, if the mold is not properly vented, some sections will not become filled.

Since the molds are usually hand-poured, the flow of the molten metal is smooth and there is little likelihood of entrapping air in the metal. The speed of operating the mold should be governed by the size of the casting and the amount of heat transmitted to the mold from the casting. Small castings can be poured more rapidly than larger ones. It is a good plan when casting, to have one man pour while another operates the molds.

Permanent molds are kept relatively hot while in operation, but considerably below the melting temperature of aluminum alloys, so that the moderate chilling of the mold imparts a dense fine grain to the casting, resulting in an increase in tensile strength, elongation, and hardness. The fine grain also improves the polishing qualities of aluminum castings.

GRAY FINISH FOR TOOLS

L. R.—Is there a simple method or process for producing a gray finish on hardened and tempered tools, such as milling cutters, reamers, etc.?

Answered by A. Eyles, Moston, Manchester, England

There are several different processes for producing a gray finish. The principal difficulty lies in obtaining exactly the required color and durability. All dirt, grease, or oxide must be carefully removed from the tools before attempting to obtain the desired finish.

The cleansing process involves three factors, namely, mechanical cleaning, removal of grease, and chemical cleaning. The mechanical cleaning consists of removing dirt and dust by washing with water or scouring with wire brushes, sometimes with the aid of sand or pumice stone. After this, the parts are thoroughly washed with clean water. To remove the grease, the tools should be boiled in caustic soda, using one part of caustic soda to ten parts of water. An even better method of removing the grease is to use "Oakite" platers' cleaner in the proportion of four to six ounces of the cleaner to one gallon of water.

After cleaning, the tool should not be exposed to the air any longer than is necessary, but should be immediately subjected to the chemical cleaning operation, by immersing it in a solution composed of sixteen ounces of sulphuric acid, eight ounces of nitric acid, and two ounces of zinc. When the zinc is dissolved in the sulphuric acid, the nitric acid is added. This mixture leaves the steel quite bright, whereas dilute sulphuric acid alone generally leaves the metal almost black or of a different appearance at the edges. After this treatment, a good washing with clean water is absolutely necessary.

Now, a good gray finish can be produced by immersing the tools in a solution consisting of four ounces of hyposulphite of soda, two ounces of lead acetate and one gallon of water. After dissolving the soda and lead acetate in the water, the solution should be gradually heated to a temperature of about 212 degrees F. The tools are then immersed in this solution and allowed to remain in the bath long enough to acquire the desired color. When the tools are taken from the bath, they should be well rinsed in hot water and dried in sawdust moistened with paraffin oil.

Some experimenting may be necessary to determine the length of time the work should remain in the solution and the temperature required to produce the desired finish. The color obtained varies also with the steel used for the tools, a chromium steel taking an entirely different shade of color from that taken by a nickel-chromium or a straight carbon steel.

Sand-blasting is another good method of obtaining a gray finish on steel tools. A gray mat surface is obtained very quickly by the sand-blasting process. Also, the sand-blast serves to clean the parts, removing all scale, dirt, or rust. The hardness of the tools influences the coloring of the work. Varying the length of time the work is subjected to the sand blast and increasing or decreasing the pressure of the blast are means by which the color or finish can be changed to suit the requirements of different classes of work.

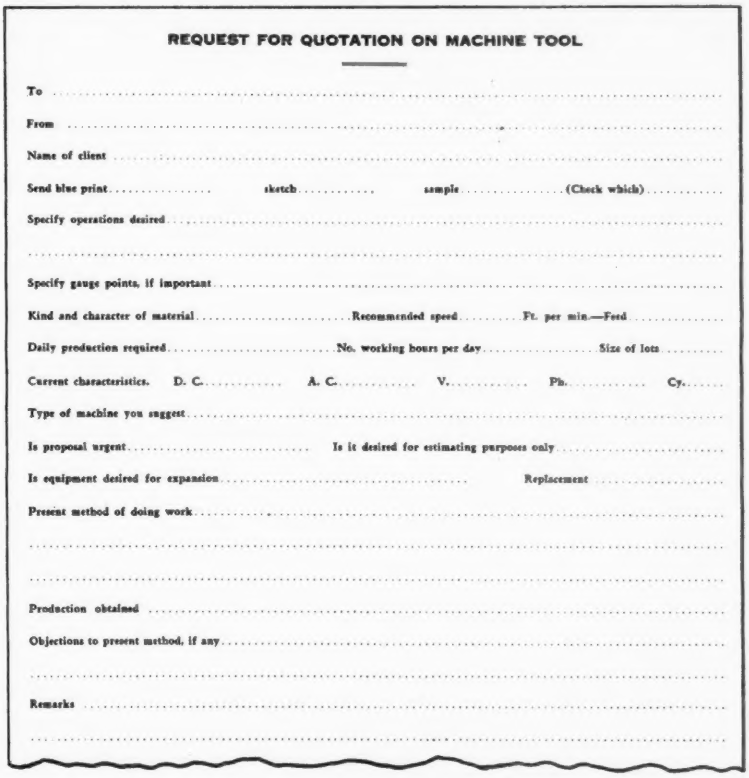
Asking for Quotations on Machine Tools

Adequate Information Must be Given to the Machine Tool Manufacturer in Order to Enable him to Prepare a Satisfactory Proposal

By G. SWAHNBERG, Chief Engineer, Kingsbury Machine Tool Corporation

A LARGE proportion of the inquiries received by machine tool builders from prospective customers lack the necessary data for making an accurate estimate and preparing an intelligent proposal. Although most inquiries for machine tools come from men familiar with the purchase of machinery, they frequently puzzle the machine tool builder because of this lack of information.

One of the points often neglected in requesting an estimate on a motor-driven machine is the electrical current characteristics; another is the locating points, equally important for estimating and for designing any special fixtures that are to be included with the machine. Often no idea of the production requirements is given, so that the estimator is at a loss to know whether a comparatively inexpensive type of machine for limited production is needed, or an automatic or semi-automatic machine capable of high production is required.


REQUEST FOR QUOTATION ON MACHINE TOOL

To ....

From ....

Name of client ....

Send blue print .... sketch .... sample .... (Check which) ....

Specify operations desired ....

....

Specify gauge points, if important ....

Kind and character of material .... Recommended speed .... Ft. per min.—Feed ....

Daily production required .... No. working hours per day .... Size of lots ....

Current characteristics. D. C. .... A. C. .... V. .... Ph. .... Cy. ....

Type of machine you suggest ....

Is proposal urgent .... Is it desired for estimating purposes only ....

Is equipment desired for expansion .... Replacement ....

Present method of doing work ....

....

....

Production obtained ....

Objections to present method, if any ....

....

Remarks ....

....

Form Suitable for Recording the Information Required for Quoting on Machine Tools

Part prints from which the title plate of the print has been cut off are sometimes sent with inquiries received from machinery dealers. As the material is frequently specified in the title plate, this information is missing unless it is given in the letter, which is not always the case.

Occasionally the prospective purchaser has had a great deal of experience in machining a certain material, and as a result, has established the proper feeds and speeds with which his tools will give the best service. In looking for replacement equipment or new methods, time and trouble can be saved both by the prospective customer and the estimator if this information is given at the outset. The same is true of any unusual cutting tools that have been developed successfully by the user over a period of time. Such information, too, is often withheld when inquiries for new equipment are sent out, with the result that the machine tool manufacturer has to go through an unforeseen intensive experimental period after he obtains the order. This not only adds to the expense of building the machine, but increases the length of time required, and thus affects the delivery date to the detriment of the customer.

All inquiries, their usual tone of urgency notwithstanding, are not, as a rule, matters of immediate demand—"yesterday" delivery is not always imperative. If the urgency of the proposal and delivery are truthfully stated in the inquiry, the machine tool manufacturer can schedule his work correctly, so that real rush jobs can be given preference.

To provide the necessary information to the machine tool manufacturer, the quotation request form shown in the accompanying illustration was developed. It calls only for such information as is essential for the majority of machine tool quotations. Space is left at the bottom of the blank for additional remarks and sketches. (This part is not shown in the illustration.) For certain types of machine tools, the form, of course, would require some changes; for others, every question would not need to be answered, but experience over a period of years shows the desirability of most of the in-

GUNNAR SWAHNBERG, after graduating from high school at Gardner, Mass., obtained his first mechanical experience in woodworking machine shops in that city. In 1918, he graduated from the industrial mechanical engineering course at Pratt Institute, Brooklyn, N. Y., and then entered a field artillery officers' training school. After receiving his commission, he left the Army in 1919 and was later employed by the Union Twist Drill Co., of Athol, Mass., and by the National Twist Drill & Tool Co., the Wilton Engineering Co., and the Hudson Motor Car Co., all of Detroit, Mich., his work consisting of the designing of production equipment. Returning East, he became machine designer with the Kingsbury Mfg. Co., Keene, N. H., when that concern started a department for building automatic drilling machinery. When this department became the Kingsbury Machine Tool Corporation, Mr. Swahnberg was made chief engineer.

formation requested on the form. Some of the larger corporations have standard forms for requesting quotations. These are usually so general in scope that they specify only a few of the details listed on the form shown.

The machine tool manufacturer is able to give selling information only in the same proportion as he receives the required information. Incomplete data in the beginning means revised proposals and the need for going over the same ground twice on the part of manufacturer, dealer, and customer, with consequent loss of time and additional expense to all.

* * *

The research laboratories of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., have recently developed a device for measuring the oiliness of oil. The device consists of a weighted platform supported by three highly polished steel balls and resting on an equally highly polished steel plate which is covered with a film of oil. The steel balls cut through the fluid film and rest on the compressed film built up by certain molecules present in the lubricant. The plate is fastened to a hinged platform which is raised slowly by means of a crank. Thus, the angle between the plate and the horizontal is increased gradually until the weighted platform supported by the steel balls moves, slipping over the film of molecules. The slightest movement of the platform is rendered perceptible by the action of a voltmeter connected in a circuit. The tangent of the angle between the plate and the horizontal attained when the platform begins to slide is the coefficient of friction. In this way, the device, determining the angle at which the balls will slide over the film of lubricant molecules, measures the oiliness of the oil. Of course the smaller the angle, the greater the oiliness and the better the oil for lubrication purposes.

* * *

It is planned to hold an International Import Exposition at the Grand Central Palace in New York City, August 4 to 9. No products made in the United States will be exhibited.

Tool, Die and Fixture Contest Prize Winners

The fifteen prizes offered by MACHINERY for the best articles on unusual tools, jigs, fixtures, dies, gages, inspection devices, or measuring instruments employed in machine shop work have been awarded as follows:

Fifty Dollar Prizes
- F. H. Beulwitz, Chicago, Ill.
- R. Bartlett, Toronto, Canada

Thirty Dollar Prizes
- Halvor Anderson, Kenosha, Wis.
- Elmer C. Cooley, Syracuse, N. Y.
- Fred J. Sanders, Dayton, Ohio
- W. R. Graham, Roselle, N. J.

Twenty Dollar Prizes
- Hans Schmidt, East Orange, N. J.
- I. F. Yeoman, Elkhart, Ind.
- Russell H. Stout, Richmond, Ind.
- George H. Pickhard, Newark, N. J.
- Fergus T. O'Conner, Detroit, Mich.
- H. C. Meyers, Grand Haven, Mich.
- H. R. Hageman, Ontario, Cal.
- Frank V. Keip, Adrian, Mich.
- H. H. Henson, Chattanooga, Tenn.

In addition to these prize-winning articles, many other descriptions of tools, dies, fixtures, and gages were submitted, most of which will be published during coming months in MACHINERY. The tool designer and shop equipment engineer will find many suggestions for improved tools and methods in these articles contributed by tool engineers throughout the country.

TESTING SHEET STEEL FOR WELDABILITY

One of the important considerations in welding sheet steel by the oxy-acetylene process is the selection of suitable material. It does not matter how skilled the welder, nor how high grade his equipment, if he is handicapped by a poor grade of material, the finished product will not be satisfactory.

Chemical composition alone is not a sufficient indication of the quality of sheet steel. Minute amounts of impurities in the steel may make it unsuitable for welding. Some of these do not show up in the ordinary chemical analysis, but they have a decided effect on the behavior of the steel under the welding flame. Sheet steel intended for welding, therefore, should be bought with the understanding that it shall be suitable for that purpose, and it should be tested as it is received from the mill.

A test may be made in the following manner: Select a piece of sheet about 6 inches square and place it flat on the welding table; fit a welding tip to the blowpipe one size smaller than that prescribed for the work on the regular welding chart; light the blowpipe and adjust the flame to neutral. Hold the blowpipe so that the tip of the inner cone of the flame is about 1/8 inch away from the sheet. Move the flame slowly in a straight line so that the sheet will be melted without burning clear through. After a strip about 3 inches long has been melted in this way, hold the blowpipe still until a hole is burned through.

If the sheet is of high quality, the path followed by the blowpipe will be free from an excess of oxide or scale and regular and smooth on the upper side. The under side of the test sheet will show a slight sag of smooth metal, free from oxide. The hole will be round and have smooth, rounded edges.

Sheet of inferior quality will show an oxide deposit on the upper side, part of which will be porous or flaky scale. There will also be a succession of irregular ripples. The under side will show a sag covered with oxide. There may even be a series of small holes blown through by the sparking action of the impurities. The hole will be irregular with rather ragged edges.

PRACTICE IN THE USE OF CUTTING FLUIDS—3

Data from Seventy-five Plants where Large Quantities of Cutting Fluids are Used. This Table Gives the Number of Users for Each Class of Fluid, and Applies to Heavy or Roughing Cuts; Similar Data for Light Finishing Cuts Showed About the Same Practice

Machining Operation	Cast Iron					Brass				
	Dry Cutting, Including Air Blast	Water or Emulsions		Oils, Oil Mixtures, etc.		Dry Cutting, Including Air Blast	Water or Emulsions		Oils, Oil Mixtures, etc.	
		Number of Plants Using	Fluids Most Used*	Number of Plants Using	Fluids Most Used*		Number of Plants Using	Fluids Most Used*	Number of Plants Using	Fluids Most Used*
Turning	44	6	4-M, 1-G	1	1-P	30	10	6-M	13	7-P, 3-S
Boring	43	7	3-M, 1-G	1	1-P	25	12	6-M	11	6-P, 3-S
Drilling	44	10	6-M	1	1-P	29	11	5-M	10	4-P
Reaming	35	6	2-M, 1-G, 1-J	11	4-P, 2-U	17	16	8-M	16	5-P
Threading	27	4	2-M, 1-Z	14	5-P	16	13	9-M	19	8-P
Tapping	17	8	2-M, 2-Z	31	11-P, 6-U	16	12	8-M	25	9-P, 4-S
Milling	41	9	5-M	2	2-P	26	13	9-M	7	3-P
Shaping	34	0	....	1	1-P	26	0	...	1	1-P
Planing	36	0	....	0	...	27	0	...	1	1-P
Gear Cutting	26	5	2-M	2	1-S	16	6	3-M	13	5-P, 3-S
"Automatics"	6	0	....	3	1-P	2	2	1-J, 1-M	26	11-P
Turret Lathes	29	3	2-M	4	2-P	16	12	5-M	16	10-P
Slotting	27	0	....	4	2-P	22	2	1-M	6	2-P
Broaching	13	6	3-M	7	2-N, 2-P	6	8	6-M	14	6-N, 4-P, 3-S
Cutting off	23	6	5-M	4	4-P	15	9	7-M	11	6-P
Cold Sawing	17	10	7-M	6	2-P	11	11	8-M	11	4-P
Grinding	9	30	7-E, 7-M	2	1-W	7	23	6-M, 4-E	2	1-V
Lapping	2	0	....	13	3-P	0	0	...	6	2-P, 2-U

*The numbers in columns headed "Fluids Most Used" represent the number of plants, and the letters, classes of fluids used, as shown by the following key:

E = Water + alkali
G = Water + alkali + fatty oil + mineral oil
J = Water + fatty oil + mineral oil
M = Water + mineral oil + soap
N = Fatty oil
P = Fatty oil + mineral oil
S = Fatty oil + mineral oil + sulphur
U = Mineral oil
V = Mineral oil + kerosene
W = Kerosene
Z = Water + oil + sulphur

Data from paper on "Present Practice in the Use of Cutting Fluids," by S. A. McKee, presented at the annual meeting of the American Society of Mechanical Engineers, December, 1929.

MACHINERY'S Data Sheet No. 181, New Series, July, 1930

PRACTICE IN THE USE OF CUTTING FLUIDS—4

Data from Seventy-five Plants where Large Quantities of Cutting Fluids are Used. This Table Gives the Number of Users for Each Class of Fluid, and Applies to Heavy or Roughing Cuts; Similar Data for Light Finishing Cuts Showed About the Same Practice

Machining Operation	Copper					Aluminum				
	Dry Cutting, Including Air Blast	Water or Emulsions		Oils, Oil Mixtures, etc.		Dry Cutting, Including Air Blast	Water or Emulsions		Oils, Oil Mixtures, etc.	
		Number of Plants Using	Fluids Most Used*	Number of Plants Using	Fluids Most Used*		Number of Plants Using	Fluids Most Used*	Number of Plants Using	Fluids Most Used*
Turning	16	7	2-M, 1-J	12	4-P, 2-S	9	8	2-M	20	8-W, 4-U
Boring	12	8	3-M	11	4-P, 2-S, 2-U	9	7	2-M	18	7-W, 3-U
Drilling	9	10	5-M	11	3-P, 2-U, 2-W	8	8	2-M	27	12-W, 5-U
Reaming	3	7	4-M	20	4-N, 4-P, 3-W	4	9	3-M	26	11-W, 5-U
Threading	3	9	4-M	18	5-P	3	5	2-M	30	10-W, 4-U
Tapping	1	10	5-M	21	4-P, 3-N	5	4	2-M	32	11-W, 5-U
Milling	5	8	4-M	13	2-N, 2-P, 2-U	10	9	3-M	19	7-W, 5-U
Shaping	17	1	1-M	2	1-N	15	0	...	9	6-W
Planing	16	1	1-M	1	....	13	0	...	10	7-W
Gear Cutting	2	3	1-M	7	3-N	2	3	1-M	8	6-W
"Automatics"	0	1	1-J	17	6-P, 3-N	1	1	1-M	13	3-W, 2-Q, 2-S
Turret Lathes	3	11	3-M, 2-J	16	7-P	5	5	1-G, 1-M, 1-K	19	7-W
Slotting	7	3	2-M	8	2-U	6	2	1-G, 1-M	13	8-W
Broaching	0	4	4-M	8	4-N	1	2	2-M	13	8-W
Cutting off	3	8	4-M	10	3-P	5	4	3-M	14	7-W
Cold Sawing	6	7	5-M	9	3-P, 2-U	6	4	3-M	11	4-W, 2-U
Grinding	4	12	4-M, 2-E	2	1-V	2	9	2-E, 2-M	8	3-V, 2-W
Lapping	0	0	....	5	2-P, 2-V	0	0	....	3	2-W, 1-V

*The numbers in columns headed "Fluids Most Used" represent the number of plants, and the letters, classes of fluids used, as shown by the following key:

E = Water + alkali
G = Water + alkali + fatty oil + mineral oil
J = Water + fatty oil + mineral oil
K = Water + fatty oil + mineral oil + soap
M = Water + mineral oil + soap
N = Fatty oil
P. = Fatty oil + mineral oil
S = Fatty oil + mineral oil + sulphur
U = Mineral oil
V = Min. oil + kerosene; W = Kerosene

Data from paper on "Present Practice in the Use of Cutting Fluids," by S. A. McKee, presented at the annual meeting of the American Society of Mechanical Engineers, December, 1929.

MACHINERY'S Data Sheet No. 182, New Series, July, 1930

Progressive Plants Modernize Equipment

Many Industrial Executives are Using the Present Time to Improve Methods and Install Efficient Machinery for Future Use

A SHORT time ago Frederick A. Geier, president of the Cincinnati Milling Machine Co., addressed a letter to a number of leading executives in the industrial field. Mr. Geier stated in this letter that his company is looking over the possibilities of lowering shop operation costs, and whenever new equipment promises a saving and a reasonable return on the investment, such equipment is being installed. He asked other executives whether they did not believe that, if the manufacturing world in general would act along these lines, it would be of material help in the present business situation.

From the replies received, the following brief excerpts are made, indicating the trend of opinion among those who occupy leading positions in industry.

Progressive Automobile Companies are Getting Ready for the Next Peak in Business

The president of a well-known automobile company writes, "There is no question but that this is a good time for people who have the necessary means to place their houses in order for future business. In due time this country will return to a very prosperous condition, and everyone should be in a position to take advantage of the demand when the time comes." The president of another large company in the automotive field says, "Companies that are amply financed will, if they are wise, continue to buy cost-saving equipment. Certainly that is our plan and policy."

The general manager of another large automobile concern states, "The exact policy outlined in your letter is the one that has motivated our company for the last four years, and today we believe that we have as fine and up-to-date a shop as anyone in the automobile business." The vice-president of one of the large automobile accessory companies says, "We have spent a great deal of money for equipment and facilities; and where we can effect savings within a reasonable period of time by the purchase of up-to-the-minute equipment, we have not hesitated to do so."

The vice-president of a well-known aircraft corporation writes, "We have always followed the policy of purchasing equipment at any time when we found that it would improve our quality or reduce our costs." The president of a large company making gasoline and Diesel engines says, "We have recently completed the installation of machinery that will materially reduce our costs."

The electrical industry voices similar opinions. The president of one of the largest electrical companies states, "When improvements in methods and equipment will produce economies adequate to yield a reasonable return on the additional investment required, I think there should be no hesitation at this time in installing such equipment and thus being fully prepared to handle the business of the future on the most economical basis."

A Pump Manufacturer Has Found an Optimistic Attitude Justified

The president of one of the largest companies in the pumping machinery field says, "Since the first of the year we have maintained our full force of employes, installing new machinery where needed, so as to be ready to turn out increased volume when prosperity returns. I am very optimistic that we are going to have a good year. Our shipments so far are only 4 per cent behind those of the same period last year."

An interesting comment is made by the president of one of the largest companies in the country making material-handling equipment. He says, "The program you outline is one that has been followed by our company for many years. We do not wait until our machines cannot produce, but each year, whether in good or bad times, we carry out our obsolescence program."

The treasurer of a well-known textile machinery plant comments that, unfortunately, "people with money in the bank are hanging on to it, and unless direct economies can be shown, they are not making any particular move. We, ourselves, when we see a tool that can pay for itself in the period of time set for it, are making the necessary changes."

From one of the manufacturers of agricultural machinery the following information was received: "Our company has not stopped making improvements. Some are being carried out at this very time and others are being projected."

In the letters from the presidents of two progressive railroad companies, a note of confidence is in evidence. "We are carrying out our policy of doing the usual large amount of improvement work both on fixed property and equipment. We are building in our shops as much of our rolling stock as possible. This work is scheduled so as to provide, as far as practicable, steady employment in our shops throughout the winter season." . . . "There is no question that if business men generally were to adopt the attitude proposed, a notable improvement would take place."

Letters from a Broad Cross-section of the Industry All Voice the Same Ideas

The following quotations from letters received from the chief executives in various industries are

also of interest. "We are bringing all plants and machinery up to date and are employing as many men as possible on construction and development work."

"During the past year we have spent a great deal of money in improving our plant and are continuing to spend a reasonable amount."

"We have for some months past been working with great success along the lines indicated. Some of the savings effected by changing methods have been rather startling."

"Our policy is to keep our shop in steady operation for at least fifty weeks during the year, although we are in a business that is highly seasonable. We ship over 50 per cent of our production in three months, so that it requires confidence as well as a greatly increased investment in inventory to insure steady employment for our men; but we have found that this investment is sound and profitable."

"This is exactly the procedure that we have been following. If more companies would adopt this policy of replacing obsolete equipment, it would help the present situation materially."

"We have bought what is, for us, an unusually large amount of new and up-to-date machinery and equipment."

An Attitude Toward Business that Insures Success

A letter from the vice-president of one of the well-known chain manufacturing companies sums up the situation very well: "We believe one of the best times to take stock of production methods and to eliminate the weak points is when business is quiet. We spent just as much money for new equipment this year as we did last year. We have very little patience with those who believe that the country is 'going to the dogs' every time there is a recession, and we propose to be in a position to take advantage of the next up-swing in business."

No wonder that this company and all the others from which similar replies were received have been unusually successful in the past.

Drilling Machine Operations on Austin Cylinder Blocks

The engine used in the Austin automobile is of the four-cylinder type and is considerably smaller than the engines used in other automobiles made in this country. As a result, the tooling may be simple and yet very effective. Some of the equipment used for performing various operations on the engine castings is shown in the accompanying illustrations. This equipment was furnished by the Cincinnati Bickford Tool Co., Cincinnati, Ohio. The machine in Fig. 6 is a 24-inch upright drilling machine; the others are direct-driven 21-inch machines.

Fig. 4 illustrates the equipment used for countersinking the four spark-plug holes in the combustion chamber face of the cylinder head. This machine has a single speed and is hand fed. It is equipped with a four-spindle drill head which is supported on an auxiliary slide on the column.

The spark-plug holes are tapped on the machine shown in Fig. 5, which is especially equipped with a lead-screw on the spindle for positive-lead tapping. A reversing motor is employed and a solenoid brake, in conjunction with adjustable limit switches. The fixture is indexed manually into four positions.

The eight valve tappet holes are counterbored 1 1/4 inches in diameter, four at a time, by means of the equipment illustrated in Fig. 1. This machine also operates at a single speed and is hand fed, and there is a four-spindle drill head supported on an auxiliary slide on the column. The valve tappet holes are drilled and reamed four at a time with similar equipment.

The expansion plug hole in each end of the cylinder block is bored on the machine shown in Fig. 2.

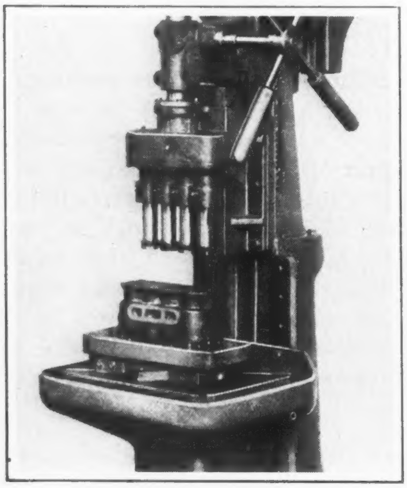


Fig. 1. Set-up of Machine Used in Counterboring the Eight Valve Tappet Holes

Fig. 2. Fixture Used in Boring the Expansion Plug Holes in the Cylinder Block

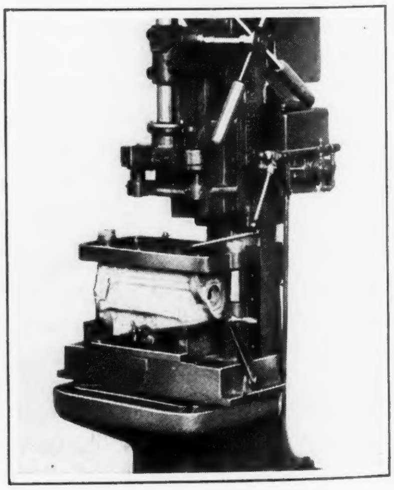


Fig. 3. Equipment Employed for Drilling and Reaming Locating Holes in the Crankcase

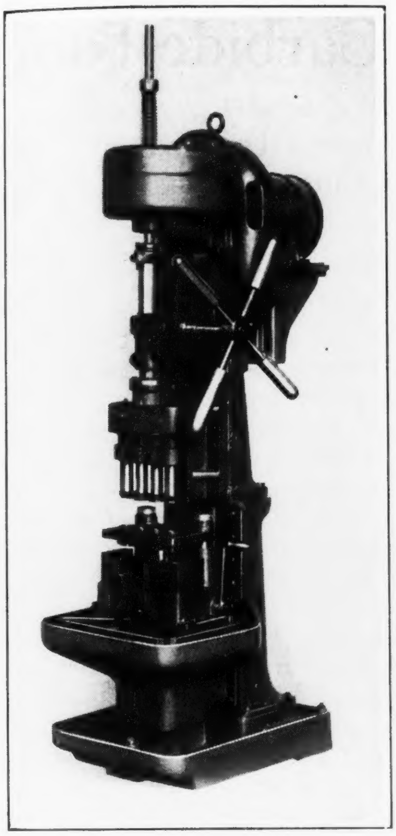


Fig. 4. Drilling Machine Used for Countersinking the Spark-plug Holes of Austin Cylinder Heads

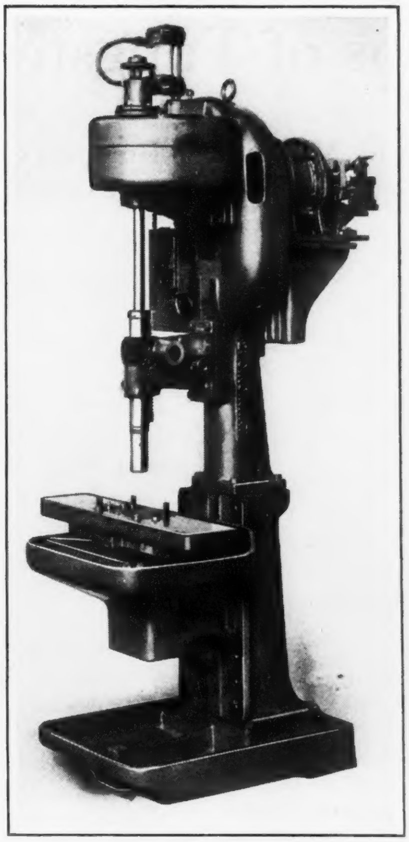


Fig. 5. Machine with Lead-screw on Spindle for the Positive-lead Tapping of Spark-plug Holes

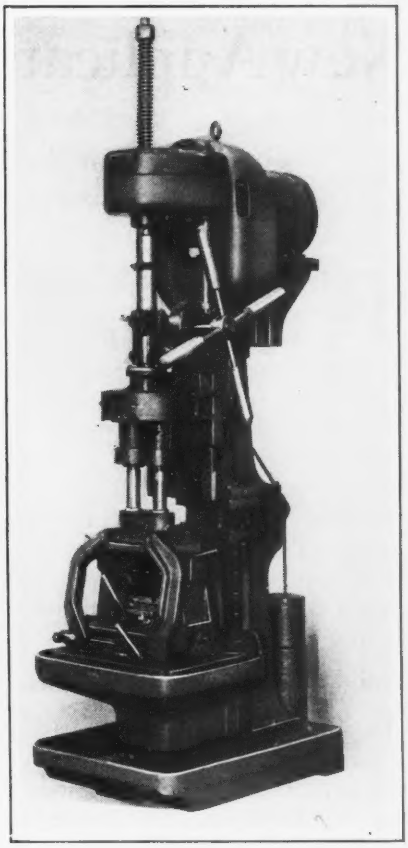


Fig. 6. Equipment Employed for Boring the Cylinders in the Engine Block, Two at a Time

A combination tool is used, and the fixture is indexed 180 degrees for performing the operation on both ends. This machine also has a single speed and a hand feed.

The most unusual equipment of the group is that provided on the machine illustrated in Fig. 6, which is used for rough-boring the cylinders in the engine block. A similar machine is used for finish-boring the cylinders. Both of these machines are equipped with a two-spindle head supported by a slide on the column and specially counterbalanced. The fixture indexes to two positions. The boring tools are held in accurate alignment by a long bronze bushing.

The aluminum crankcase of the engine is handled on drilling machines provided with equipment similar to that shown in Fig. 3. The particular machine illustrated drills and reams two 1/2-inch locating holes by using combination tools.

Machine Tool Dealers Discuss Installment Selling

The Associated Machine Tool Dealers, an association including the leading machine tool dealers in the United States, met in a Spring Convention at Granville, Ohio, June 4 and 5. One of the important papers presented before the meeting was that by Omar S. Hunt, president of the Marshall & Huschart Machinery Co., of Indiana, on the subject of "Selling Machine Tools on the Installment Plan." This paper called attention to the possibilities of installment selling in the machine tool field, and made a plea that machine tool dealers, in handling "time sales," recognize the need for proper interest and financing charges.

Mr. Hunt advocated a conservative plan of installment selling. In part he said, "A survey of the machine tool industry in 1927 indicated that 44 per cent of the machine tools in the United States were ten years or more old, and I believe that this percentage is even greater at the present time. If we can go into a plant and show that a modern machine tool would save time and make money, and if we can give the purchaser a reasonable period of time in which to pay for his machine, I think that we would have a much better chance of selling than we have when we go into the office and demand cash in thirty days."

Another subject discussed at the meeting was the sales contract proposed by the joint action of the Association and a committee of the National Machine Tool Builders' Association.

The officers of the Association are: President, E. P. Essley, of the E. L. Essley Machinery Co., Chicago, Ill.; vice-president, J. W. Wright, of the Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; secretary and treasurer, A. G. Bryant, of the Joseph T. Ryerson & Son, Inc., Chicago, Ill.

New Applications of Tungsten-Carbide Tools

The American Society of Mechanical Engineers at Detroit Devoted an Entire Session to the Consideration of the New Cutting Tools

THE Machine Shop Practice Division of the American Society of Mechanical Engineers, at the semi-annual meeting of the Society in Detroit, June 9 to 12, devoted an entire session to papers and reports on the application of tungsten-carbide tools in the metal-working industries. After an introductory address by Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, three papers on different phases of the application of the new cutting tools were read, and a report was presented by the Society's research sub-committee on tungsten-carbide cutting tools.

Cutting Tests with Tungsten-carbide Lathe Tools

A record of an investigation of the application of tungsten-carbide lathe tools under heavy duty was presented by T. G. Digges, associate metallurgist of the Bureau of Standards. In these tests, relations were determined between the speed, feed, depth of cut, and tool life for a selected form and size of tool. The tests were made in cutting 3.5 per cent nickel steel forgings, heat-treated to give tensile strengths varying from 85,000 to 110,000 pounds per square inch. These tests were all made cutting dry. While very extensive and thorough, these tests are, nevertheless, but a small beginning in the field of research on these cutting tools.

Application of Tungsten Carbide to Saws for Metal

In a paper read by C. M. Thompson, products engineer, Henry Disston & Sons, Philadelphia, Pa., the changes that have recently taken place in the design of saws, to make possible the application of tungsten carbide, were described. The paper also outlined the results obtained with saws provided with tungsten-carbide tipped teeth in cutting various materials. The subject was very completely covered, and numerous illustrations were included.

The Use of Tungsten Carbide as a Cutting Material in Heavy Machine Tools

A brief review of the experience of an early user of tungsten-carbide tools in cutting cast iron was given by Coleman Sellers, 3rd, executive engineer, William Sellers & Co., Inc., Philadelphia, Pa. The steps taken to introduce tungsten carbide in the machine shop and the methods employed to check up on the results obtained were described. The importance of correct grinding was stressed, and a few suggestions were given covering grinding procedure, clearance angles, and shapes of tools. Six successful applications in the planing, boring, and rough- and finish-turning of heavy machinery parts were described in detail.

Review of Present Application of Tungsten-carbide Tools

The special research committee on the cutting of metals of the American Society of Mechanical Engineers, with the assistance of the National Machine Tool Builders' Association, has compiled a report which was presented at the meeting in Detroit. This report is based on questionnaires sent to more than 600 users and builders of machine tools, requesting specific information concerning their experience with the use of tungsten-carbide tools.

The report shows that, while a relatively small average number of machining operations are now being regularly performed by the use of tungsten-carbide tools, there are two companies, each of whom uses these tools for more than 500 operations. An idea of the limited extent of the application, however, may be had by comparing the percentage of tungsten-carbide tools in use with the total number of tools applied. This percentage, for the industry as a whole, as based upon the replies to the questionnaire, is less than 1 per cent, although three manufacturers report 5, 15, and 25 per cent, respectively, and one company uses tungsten-carbide tools for 75 per cent of all cast iron turning.

One company is planning to equip one thousand machines with tungsten-carbide tools for the general machining of metals, and another is conducting tests that may lead to the use of these tools exclusively on all cast iron, semi-steel, bronze and brass machining, with the possibility of extending the application to one thousand different parts.

The Materials for which Tungsten-carbide Tools are Best Suited

Experience indicates that tungsten carbide is very valuable as a cutting material on all non-ferrous metals, regardless of the hardness or the condition of the surface, especially for roughing cuts on production jobs. Not all are agreed, however, that finishing can be done as satisfactorily as with high-carbon or high-speed steel tools.

Cast iron can be machined readily with the tungsten-carbide tools even when the surface has a hard sandy scale. One company reports: "We have to cut through chaplets and welds where blow-holes have been acetylene-welded. Tungsten carbide does not fail in cutting through these defects." Others report similar experiences.

A difference of opinion exists as to the advantage of using tungsten-carbide tools in machining steel. Several report failures in attempts to improve on high-speed steel performances, while others are enthusiastic about the use of tungsten carbide for

machining steel and state that they have machined alloy steels readily which could not be machined economically with high-speed steel. One company reports machining a hand-forged nickel-chromium steel airplane propeller shaft. They state: "It was extremely tough and irregular in shape, necessitating, in frequent instances, materially heavier cuts on one side than on the other. Scale conditions and hard spots were particularly difficult." The shaft was turned successfully on a Gisholt turret lathe, about ten years old, but in good condition.

Machine Equipment Used at Present with Tungsten-carbide Tools

Machines on which tungsten-carbide tools have been used successfully on regular production include practically all the standard types of metal-cutting machines, except milling and drilling machines which, replies indicate, have been equipped with tungsten-carbide tools for use principally on an experimental basis. The machines on which tests were made, or on which regular operations were being performed, in most cases were reported to be in good condition. An electric manufacturing company, in referring to the equipment, stated: "Generally one will find the equipment in fair condition and about five to ten years old. Tungsten carbide can be used advantageously on machines of this age, provided a proper selection of the tool is made."

Types and Sizes of Tungsten-carbide Tools Used

Practically all the tools used by the companies reporting were lathe or planer type tools in a large variety of shapes and sizes, some having shanks as large as 2 by 2 1/2 inches. The tips in most cases were simply brazed, though a few were inserted, and in one or two cases, they were dovetailed and brazed. The rake and clearance angles in most cases were those recommended by the suppliers, but in some instances customers found modifications of these angles desirable on certain kinds of work.

Grinding of Tungsten-carbide Tools

Lathe and planer tools constituted a large majority of the tungsten-carbide tools reported upon, and the grinding was done mostly by hand. Eight out of thirty companies reported using cutter grinder machines also. A few of the companies have the grinding done by the suppliers. One company reports grinding "not essentially different from standard tool dressing methods"; another, "Tools were ground in our tool-room by one man who was instructed as to proper methods."

A gear company, cutting cast iron, brass, and bronze castings, reported that the time consumed in grinding is from one to three hours, according to the condition of the tool. Another stated that twice the time is required that is needed for grinding high-speed steel tools, while another, machining bronze, reports three to five minutes as the average time required.

A company machining "nearly all commonly used materials" reports that considerable time is spent in sharpening tools; it is difficult to maintain a keen edge for any length of time. Another shop, doing very heavy work, stated that "after original grinding, only a few minutes each day is required for occasionally touching up the cutting edge." A company machining aluminum alloys reports that the time for grinding is negligible, and another reports that the time consumed is about five times that of high-speed steel grinding.

Apparently the practice of grinding tungsten-carbide tools differs as greatly as the grinding of tool-steel and high-speed steel tools. The importance of maintaining the correct rake and clearance angles on tools used for production work, which can only be accomplished by machine grinding, seems to be generally disregarded. The subject of grinding warrants careful attention.

Of forty companies, eleven reported the use of tungsten-carbide tools lapped or stoned. The lapping has been done mostly by hand, using a cast-iron lap, though in a few cases disk lapping machines are used, silicon carbide or diamond dust with oil being used as an abrasive. The advantage of lapping tungsten-carbide tools seems to be questionable.

Cutting Speeds and Feeds Used

The increases in cutting speeds when tungsten-carbide tools are used in cutting cast iron and non-ferrous metals have been from two to three times the cutting speeds formerly used. Many are using the highest speed that the machines will permit. One report stated relative to cutting bronze: "We have made several tests of cutting speeds, reaching a speed as high as 400 feet per minute, but could not maintain this due to the construction of our machine tool." Another reported: "In a few cases where we tried to get full speed and feed capacity of the tool, the strain on and chatter of the machines was so great that we had to cut down the speed."

The general practice seems to be to use about the same feeds and depth of cut in cutting with tungsten-carbide tools as with high-speed steel tools. There is a tendency, however, toward lighter feeds than are used with steel tools.

Results Obtained by Using Tungsten-carbide Tools

Some remarkable increases in output per grind, using tungsten-carbide tools for machining cast iron and non-ferrous metals, have been reported. These increases appear even more remarkable when we consider that the cutting speeds used, as already noted, were in most cases from two to three times the former speeds. A company machining silicon-aluminum alloys reports that by the use of tungsten-carbide tools they obtained 4500 to 35,000 pieces per grind, whereas formerly, they obtained 100 to 1800 pieces per grind. An airplane company, in turning aluminum-bronze, obtained 2000 pieces per grind using tungsten carbide, against 60 pieces per grind in the past; and in boring aluminum-alloy crankcases having eight bearings each, 50 to 75

crankcases per grind, using tungsten carbide, as against one formerly. Another airplane company stated that it could not report on the output of some of the tungsten-carbide tools, because the set-ups had not been disturbed since the tools were first put to work over six months ago. A company machining cast iron reported 1500 pieces per grind using tungsten carbide, against 100 formerly.

Longer runs without the necessity of shutting down for tool grinding result in an appreciable increase in production without spectacular increases in cutting speeds. Large economies are effected by the use of tungsten carbide on such operations, even when used on equipment that was not designed for the severe service for which tungsten carbide is suitable.

Where Tungsten-carbide Tools Have Not Proved Suitable

A few companies reported no failures whatever, although most of the companies, including those that have been able to obtain satisfactory savings using tungsten-carbide tools, have had several discouraging experiences, some due to unsatisfactory tools, others to machine deficiencies, and some, no doubt, to unfamiliarity with the technique involved in the use of the new material.

With respect to tool troubles, one company stated: "Our failures have been under heavy cuts which caused the shank of the tool directly under the cutting edge of the tungsten-carbide bit to compress and mushroom out, causing the tip to break, due to improper support."

One large company's report sums up the statements of several: "Have had the usual failures experienced by others, such as those due to tools having too great overhang, those due to intermittent cuts and to operator stopping machines and starting again with the feed on, and those due to operator running the machine in reverse accidentally and not exercising care when the tool leaves the work and when blow-holes are encountered."

Additional information given in the report will be published in a coming number of MACHINERY.

The British Metal-working Industries

From MACHINERY's Special Correspondent

London, June 17

Speaking generally, conditions in the machine tool industry continue to be satisfactory, and are certainly much better than might be expected, in view of the fact that many branches of the metal-working industries are virtually marking time. There is evidence that buyers are becoming increasingly reluctant to spend more than is absolutely necessary at the moment, but there is no reason to regard the coming months with apprehension. By the end of August it is probable that machine tool builders will be slacker than has been the case for some time, but the usual autumn business revival should do much to restore the balance. Machine tool dealers in the London district report, for the most part, that sales are being maintained, with orders for standard types predominating.

In the Birmingham district, manufacturers of turret lathes and milling machines are fairly busy, and makers of geared presses continue to work full time, although business in this connection has slackened somewhat during the past month. From the North of England satisfactory reports are at hand. After three quiet months, there is evidence of renewed activity in many districts and a number of machine tool makers are working overtime on urgent orders. Among the machines for which an especially good demand is being experienced, we may note standard and special grinding machines, horizontal boring machines, and vertical boring and turning mills.

Of late there has been some improvement in the machine tool industry in the Glasgow district, and at the time of writing, the outlook for manufacturers of lathes, shapers, boring machines, and hot and cold saws, is better than has been the case for some time. The volume of business in punching and shearing machines, however, usually a flourishing branch of the industry in this district, has been reduced to almost negligible proportions.

The Overseas Trade in Machine Tools is Declining

The April returns showed a decided fall in the value of machine tool exports, and to a lesser degree in imports. The actual exports were 1010 tons, as compared with 1245 tons in February and 1284 tons in March; but the ton value was higher. With regard to imports, there was an increase in tonnage but a decrease in value, as compared with March. The actual tonnage figures were 972 tons, while for February and March they were 1318 tons and 897 tons, respectively.

The Iron and Steel Industry Faces a Serious Condition

Generally, the position in the iron and steel industry is one of depression. The National Federation of Iron and Steel Manufacturers report that the number of furnaces in blast at the end of April was 151, a net decrease of six since the beginning of the month.

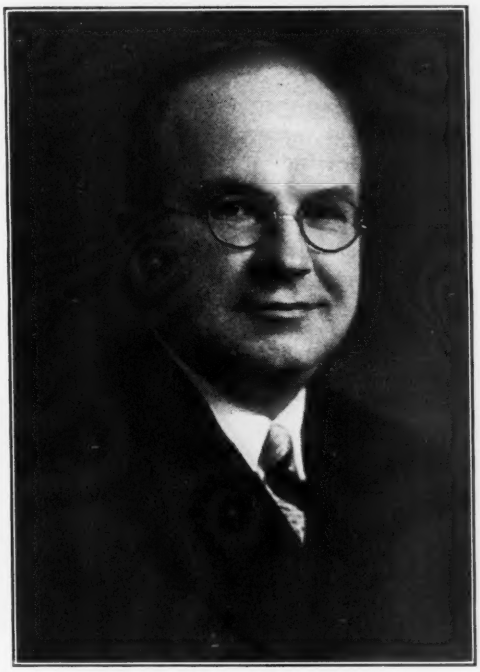
A section of the metal industry that is in a more satisfactory position is that manufacturing light alloys. The export trade in this field is expanding, and in the home market there is a steady demand from railway companies, the motor industry, and the aircraft engine manufacturers.

Foremen Meet in National Convention

The National Association of Foremen at its Meeting in Toledo, Ohio, Dealt with Many Important Phases of Departmental Management

An enthusiastic gathering of more than 1000 foremen from practically every industrial city in the United States met for the seventh annual convention of the National Association of Foremen at Toledo, Ohio, June 6 and 7. The address on the responsibilities of foremanship by G. E. Tibbits, factory manager of S. F. Bowser & Co., Inc., Fort Wayne, Ind., who for the past year has served as president of the Association, will be published in the August number of MACHINERY. Following Mr. Tibbits' address, the newly elected president, W. J. Donkel, president and general manager of the Kent-Owens Machine Co., Toledo, Ohio, stressed the need for better executives in industrial plants and pointed out that there is no surplus of men equipped for responsible work.

An enthusiastically received address on "Creating and Maintaining Profits" was made by George M. Graham, vice-president of the Willys-Overland Co. Mr. Graham outlined the need for foremen to understand departmental costs. He advocated the study of books by foremen on all subjects pertaining to their work, and advised them not to believe that the printed word is likely to be theoretical rather than practical. The foreman, he said, must know materials and tools, and he can obtain more accurate information on these subjects through the printed page than in any other way. Another address intended to enlist the foreman's interest in costs was made by T. W. Eustis of the Frigidaire Corporation, Dayton, Ohio, who spoke on "Budgeting for Profit."



W. J. Donkel, New President of the National Association of Foremen

Group Meetings on Important Subjects

Following the general addresses, the convention was divided into group meetings at which eight specific subjects were discussed: Interesting employes in eliminating waste; what the worker expects from his job; getting the executive point of view; getting the greatest value out of the older man; training shop men to become better mechanics; building an efficient departmental organization; discipline and awards; and cleanliness and order. At every one of these group conferences information directly applicable to the foreman's job was brought out by the leader of the discussion.

In discussing waste, the fact was emphasized that, in every manufacturing plant, part of the product is wasted through carelessness, poor supervision, and improper handling. Ill advised expenditures also constitute a prolific source of waste. The elimination of waste has been accomplished in many plants through educational campaigns, properly administered awards for savings made, suggestion campaigns, and use of exhibition boards. The foreman is in a position to contribute to the elimination of waste to a greater extent, perhaps, than any other man in the plant, except the chief executive.

What the Worker Expects from His Job

The discussion on what the worker expects from his job was based on a study made at the Hawthorne Works of the Western Electric Co. This study was inaugurated because it was recognized that the attitude of the employe is a prime factor in his effectiveness. Several thousand men and women in the company's employ were engaged in conversation in order to determine what they particularly like and dislike in their working environment. Briefly, most workers expect to be allowed to retain their individuality within certain limits. They do not want to be standardized or mechanized or in any way deprived of their own individuality. They expect that the job will provide them with an opportunity for self-expression and for the satisfaction of their desire for achievement and accomplishment. It is one of the important duties of the foreman to try to satisfy this desire on the part of the worker to as great an extent as possible without interfering with the efficiency or reasonable demands of this department.

Foremen Should Cultivate the Executive Point of View

In the discussion on the executive point of view, the fact that the foreman is an executive was emphasized. His functions are the same as those of the factory manager except that he controls only one department. He is responsible for the payroll and should see that the company gets value received for the money paid in wages. He is responsible for

turning out work of a given quality and in certain quantities. He is responsible for the economical operation of his department and is expected to so manage his department that the company's investment in wages, equipment, material, and overhead will be a profitable one. To get the executive point of view is, therefore, an essential in the success of a foreman.

The discussion on getting the greatest value out of the older man resolved itself largely into advice on four points, intended rather to aid the individual than to indicate how the company could help the older men. The rules laid down were to take care of one's health, keep mentally supple, live in the present, and accept the limitations of age.

New Ideas on the Training of Shop Men

Very interesting suggestions for training shop men to become better mechanics were brought out in the discussion covering this subject. Many foremen make the mistake of expecting a learner to grasp a subject when it has been explained once. It was pointed out that neither general knowledge of a subject, nor skill in performing work, can be acquired except through many repetitions, and the foreman who is a good instructor knows that he must be willing to repeat his instructions patiently again and again. You cannot teach a man to play golf by walking with him once across the course and telling him how to make each stroke; nor can you teach a man to become a mechanic by instructing him once, and expecting that he will be able to turn out first-class work after that.

Departmental Organization and Discipline

The building of an efficient departmental organization is a big subject, almost too big for a brief group conference. The rules of organization were referred to briefly. Organization was defined as the proper adjustment of the relationship between human beings in an effort to accomplish a certain definite end, whether that end is the playing of a game of baseball or the running of a machine shop department.

The discussion on discipline brought out many interesting points, and the following code was laid down for use in matters of reprimand or discipline: "Do not reprimand until you have first heard the story of the offender. Make sure that you have gathered all the facts. Be sure that the offender understands your side of the question. Do not reprimand him publicly and do not try to make the man admit that he is in the wrong. Do not enter into any discussion involving discipline if you have any question as to your own self control. Do not use threats in connection with a reprimand; it does not add to its effectiveness."

Cleanliness and Order are an Indication of Good Management

A very interesting conference was held on cleanliness and order. The value of a clean and orderly shop was strongly emphasized. In fact, the leader of the discussion went so far as to say that he had never known a clean, orderly shop to fail financially. The clean and orderly shop is an indication of system in all the departments of business, and where there is such system, failure is seldom or never met with. "Cleanliness and order," said the introducer of the subject, "should not be confused with janitor work. The removal of a lot of scrap and dirt is janitor work, but to prevent the accumulation is a matter of management, and is a proper function of the foreman."

Railway Exhibition and Convention at Atlantic City

The exhibition of railway equipment and accessories, railroad shop tools, and supplies, held in connection with the annual meeting of the Mechanical Division of the American Railway Association and the annual convention of the Railway Supply Manufacturers' Association at Atlantic City, June 18 to 25, was attended by a very large number of railway executives. About 7500 members and guests of the associations meeting in convention were registered. There were nearly 350 exhibitors, occupying 110,000 square feet of floor space.

This year the exhibit was staged in the new convention hall and exhibition building erected by the authorities of Atlantic City, and never before has the exhibition presented so impressive an appearance or been housed in such attractive quarters.

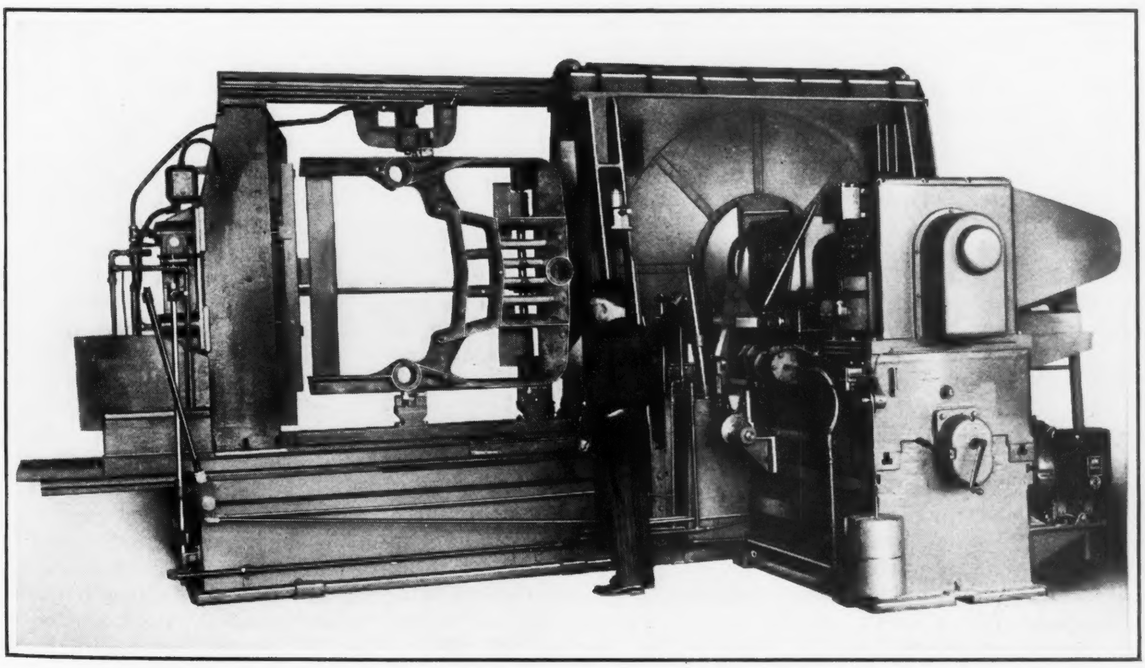
The machine tool exhibits were limited to a little more than a dozen and were confined to machines that have special application in railroad shops, some being of the spingle-purpose type intended exclusively for operations in railway repair shops. The machine tools on exhibit, however, though few in number, were practically all shown in operation, and a fine demonstration was made of their power, rigidity, and method of application to locomotive shop work. In addition, there were a number of exhibits of general machine shop equipment and material-handling appliances.

As practically all the shop equipment exhibited,—both the machine tools and the small metal-cutting tools and gages—has been illustrated and described in MACHINERY during the past year, there is no need for a detailed description of the exhibits at this time. It may not be out of place to mention, however, that if the railroad shops could take advantage of the improved equipment shown and demonstrated at the exhibition, it would doubtless result in a very great increase in the efficiency not only of the railroad repair shops, but of the rolling stock itself; and it is quite certain that a marked reduction in the cost of repair work could be effected.

BESLY DOUBLE-SPINDLE GRINDING MACHINE

Sectional heaters manufactured by the Spencer Heater Co., Williamsport, Pa., consist of one front and one rear section, with several intermediate sections between. After nipples have been placed in reamed openings, these sections are drawn together by means of clamps and locked with tie-bolts to make the heating unit complete. Each section is a finished unit. An important requirement is that the sides of each section must be machined accurately to size and flat so that gas-tight joints will be obtained by merely drawing the sections together, iron to iron, without the use of cement or packing. The openings on the front and rear sections must also be machined flat so that the doors on the front section and the smoke-pipe connections and the draft doors on the rear section will fit gas-tight, iron to iron.

To produce these flat surfaces on the sides of the heater sections, Charles H. Besly & Co., 118-124 N. Clinton St., Chicago, Ill., built the grinding machine here illustrated. This grinder is of the double-spindle type and is believed to be the largest of its kind. Two grinding members, 6 feet in diameter, are mounted face to face, so that when a section is fed in between them, both sides are ground simultaneously. The grinding members are two "Titan Steelbacs," 1 inch thick, bonded with Bakelite.



Besly Hydraulically Operated Machine for Grinding Both Sides of Large Heater Sections Simultaneously

The work is carried between the grinding members by a large traveling table fixture, mounted on ball bearings and operated by means of a hydraulic system. The heater sections are placed in this fixture at the loading position, which is at the front of the machine. Then after the section has been clamped securely by hydraulic means, the fixture is started from the loading position at a high rate of speed. As it reaches the grinding position, it is automatically slowed down to the grinding speed. The grinding members are fed against the work by weights, and "sized" by a micrometer arrangement.

When the section has been ground to the proper size, the operator pulls a lever, causing the fixture, with the section, to return to the loading position, where it automatically stops. The grinding members are drawn apart hydraulically to permit the sections to enter between them.

Sections measuring 56 by 65 by 7 inches and weighing approximately 1000 pounds are finished flat, to within 0.003 inch, in four minutes. The sections are taken to and from the machine by means of a semi-automatic overhead conveying system, which enables the operator to load and unload sections of the size mentioned in one minute. The weight of the machine is about 35 tons. It occupies an operating floor space of 30 by 40 feet and has a height of 10 feet.

The 6-foot grinding members are driven by two 50-horsepower motors, while the hydraulic systems which operate the fixture and clamping devices are driven by 7 1/2- and 3-horsepower motors. The entire machine is lubricated automatically. An exhaust system operated by a 30-horsepower motor provides for carrying away the large volume of grindings produced during the operation.

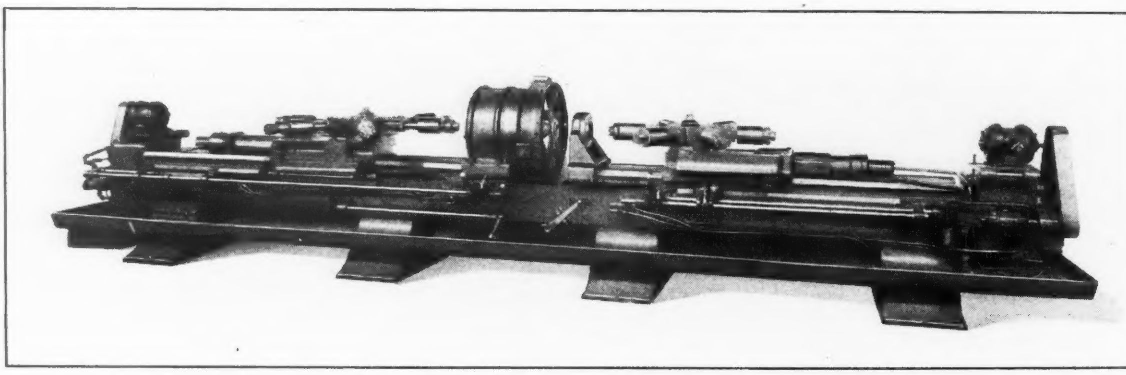


Fig. 1. "Fastermatic" Duplex Machine Designed for Simultaneously Machining Both Ends of Wheels for Agricultural Equipment

DUPLEX "FASTERMATIC" CHUCKING MACHINES

"Fastermatic" chucking machines of duplex design have recently been developed by the Foster Machine Co., Elkhart, Ind., to enable chucked work to be machined on both sides simultaneously. Fig. 1 illustrates one of these machines which has been constructed for boring, facing, chamfering, and turning the bore of wheels for agricultural machinery from both sides. The work is chucked on a head located at the middle of the bed, and is machined by two sets of tools carried on turrets.

The sequence of operations consists of facing the outside of each hub, boring the cavity, and facing a flange at the inner end of each bore. This work is divided into rough-boring and facing; finish-boring, facing, and chamfering; and a final reaming. Since there are three steps in the cycle, each turret is equipped with two sets of three tools each. By this means it is unnecessary to index the turret back to the starting position.

The machine runs automatically, a series of cams providing a rapid advance of the tools to the work, the required feeding movement, and finally a rapid withdrawal of the tools. Then the turret is indexed to the next station and the same sequence is repeated. At the conclusion of the cycle, the machine is tripped automatically to a neutral position. When the finished work has been replaced by a new piece, a control lever at each side of the head is lifted to start the next cycle of operations.

Three motors are provided for this machine, the work-head being driven by a motor at the back. All feed and rapid traverse movements of the turret and tools are accomplished hydraulically. In setting up a job, or in case of some abnormal condition, the turret movements can be effected by hand. A safety device on each turret makes it impossible for any tool to be fed into contact with the work unless the turret has been indexed and its locking bolt properly seated.

In the operation shown, the hub bore is machined to a diameter of 3 inches, minus from 0.002 to 0.003 inch, and the length of cut is 2 5/16 inches. The time required for machining both sides of the bore in these steel castings is two minutes.

Fig. 2 shows another duplex "Fastermatic" built for turning, boring, reaming, and facing the two ends of truck axle housings simultaneously. Each end of the housing is also tapped, but since the thread is right-handed in each end, it is necessary to reverse the rotation of the housing to produce the thread in the left-

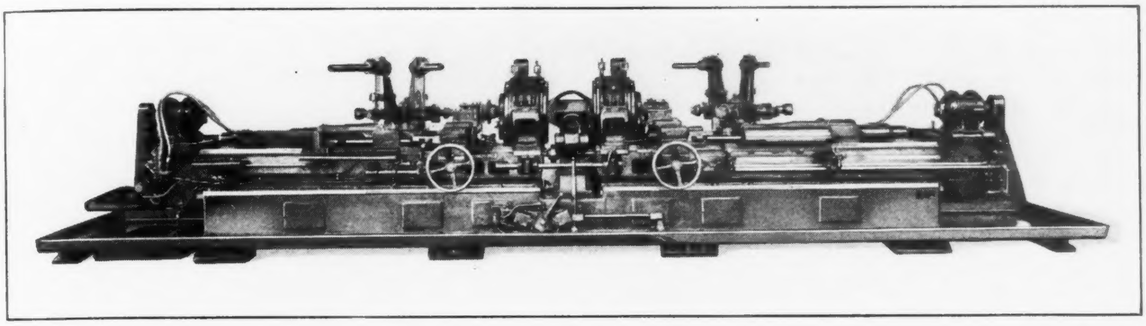


Fig. 2. Another Duplex "Fastermatic" Arranged for Machining Truck Axle Housings at Both Ends

hand end. Therefore, each thread must be tapped separately.

The main bed of this machine is planed to receive two sub-beds, which are free to slide longitudinally. Each sub-bed carries a driving head and a hexagon turret complete with an automatic operating mechanism. The sub-beds are moved together and apart hydraulically, the movements being controlled by a lever on the front of the machine.

Both heads are driven by a single motor mounted at the rear of the machine. Midway between the heads there is a swinging fixture for centering the axle housing endwise. In chucking the work, the two sub-beds are moved apart so as to provide enough space to permit the axle housing to be centered by the swinging fixture, and then the beds are brought into position over the work. Centers carried by the hexagon turrets locate the axle ends concentrically, after which the final clamping is performed and the centering fixtures are removed.

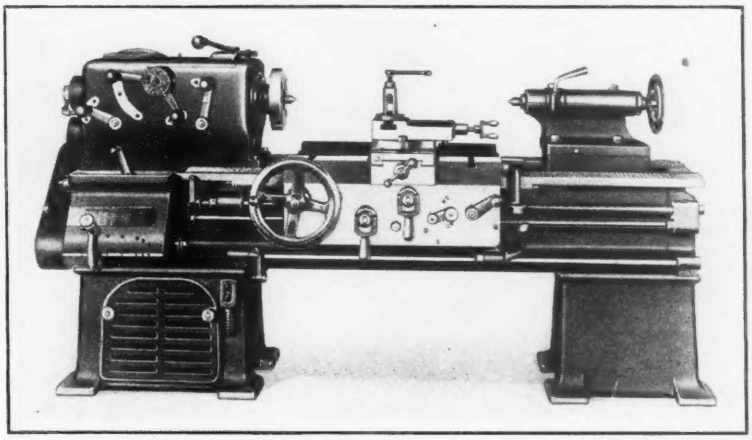
The axle housings are steel castings and vary in length to such an extent that means of compensation must be provided. Thus the cross-slides have a hand longitudinal adjustment. Any adjustment made through the cross-slide effects the same adjustment of the travel of the turret tooling, thereby maintaining a correct relation between the external finished faces and the depth of the bored holes.

FLATHER 20-INCH GEARED-HEAD LATHE

A 20-inch geared-head lathe designed to meet requirements in using tools made of tungsten carbide and the latest developments in high-speed steels is being placed on the market by the Flather Co., Nashua, N. H. The bed of this lathe is made of nickel cast iron. The headstock has been designed with a view to eliminating excessive overhang of parts. The sides and ends of the main casting are carried up and over the top of the spindle bearings instead of terminating at the center line, and the cover is fitted into instead of on the top of the casting. All shafts in the headstock are below the center line of the spindle.

The initial drive may be by belt from overhead shafting or from an individual motor. The driving pulley may be mounted either at the rear end of the headstock on a shaft connected with the large bevel gear of the reversing unit or at the back of the headstock on a shaft connected with the bevel pinion of the same unit. The first mounting is the one usually employed when the lathe is driven from lineshafting, and the second, the one used when the lathe is arranged for an individual motor drive.

The headstock spindle may be started, stopped, or reversed by moving a lever mounted on top of the headstock or one located at the right-hand side of the apron. The reversing feature is valuable in cutting threads, in removing heavy chucks and face-plates, and in machining certain types of work handled with the spindle running backward. The reversing unit is mounted on the back part of the headstock between the driving pulley and the first driving shaft. It consists of three hardened spiral-bevel gears, two of which run in opposite directions and carry multiple-disk friction clutches. Twelve spindle speeds ranging from 12 to 360 revolutions per minute are available.



Flather Geared-head Lathe Designed to Suit the Latest Developments in Cutting Tools

The reversing mechanism for both the lead-screw and the feed-rod is located inside the headstock. Only two levers on the feed-box have to be moved to obtain forty-one different feed changes. The range of standard threads that can be cut is from 2 to 64 per inch, while feeds from 0.005 to 0.170 inch per spindle revolution are obtainable.

When an individual motor drive is furnished, the preferred location for the motor is inside the front leg, but the motor may also be mounted on top of the headstock, either parallel or at right angles to the spindle.

HYRO INDUSTRIAL FURNACE

Furnace equipment designed to eliminate laborious work, obnoxious fumes, and accidents, in casehardening parts in cyanide and other salts, or in other heat-treating processes, has been placed on the market by the Hyro Mfg. Co., Inc., 200 Varick St., New York City. The accompanying illustration shows right- and left-hand units of this "Hyro Automatic" furnace installed side by side so that the finished work can be delivered into a common hopper. Buckets or boxes are placed beneath the hopper to receive the parts.

Each unit consists of a furnace and quenching tank, both of which are covered by a hood and have windows of Pyrex glass which permits the work to be observed without opening the doors. The parts to be hardened are fed into a basket in the furnace by means of a scoop. When the work has been held at the proper temperature for the required length of time, the basket is swung out of the bath by means of a carrier actuated through the handwheel at the front of the furnace, and the contents of the basket are discharged into the quenching tank.

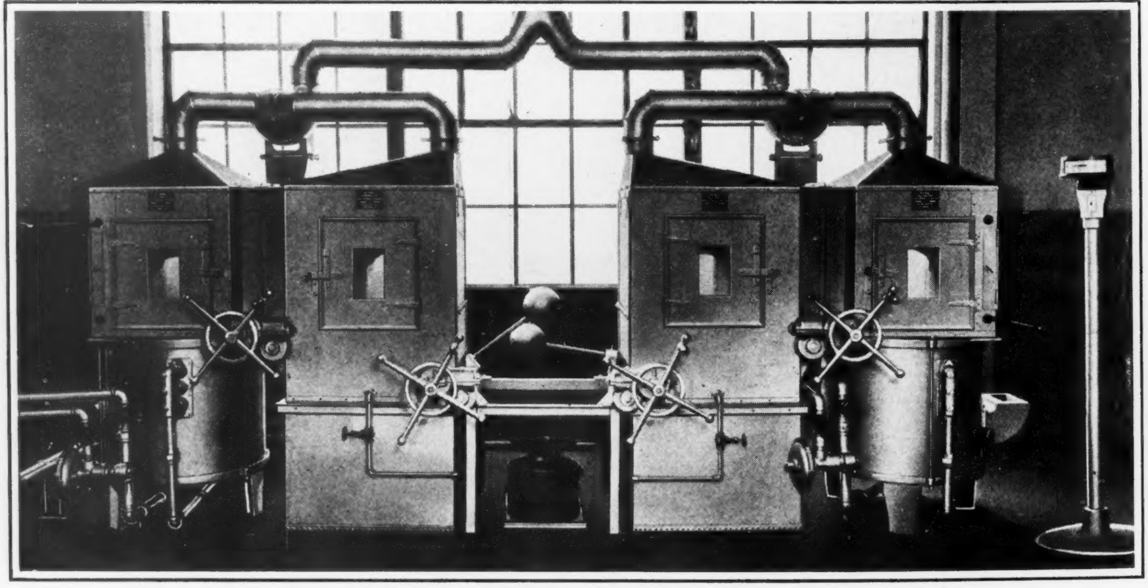
The carrier moves in a semicircle within the hoods and the sealed passageway, with the result that all products of combustion and poisonous fumes go up the flues, while all drippings from the loaded basket run back into the bath. The quenching tank is equipped with a baffle plate which separates the work as it is dumped. The baffle plate also reduces the splash that occurs when hot work strikes cold water, and it effectively prevents back splash of the quenching liquid into the hardening solution.

When the load has been discharged into the quenching tank, a reverse motion of the handle returns the basket into the pot ready for another load. After the load has remained in the tank long enough, a forward movement of a handle on the front of the tank swings a perforated tray upward, which empties the work automatically into the hopper.

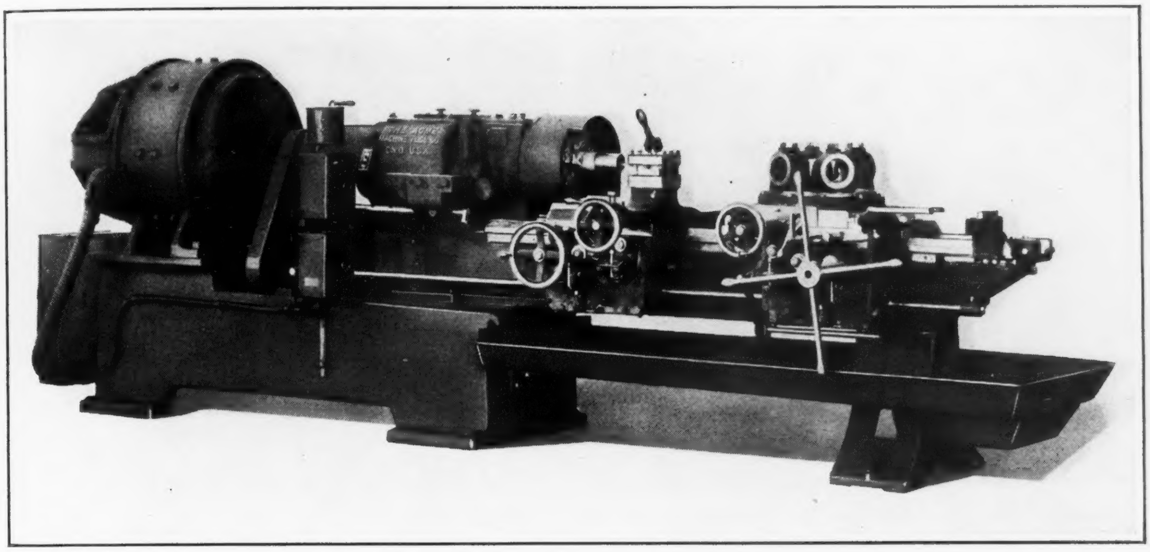
By means of the indicator seen at the extreme right in the illustration, temperature readings can be taken at any time. This indicator is portable and can be used for a battery of furnaces. An automatic device for mixing the proper proportions of gas and air is furnished for each unit. This furnace is made in six different sizes, with pots having an inside diameter ranging from 8 to 24 inches, and an inside depth of from 10 to 24 inches.

ACME TURRET LATHE DESIGNED FOR TUNGSTEN-CARBIDE TOOLS

A turret lathe designed with a view to obtaining maximum results from the use of tungsten-carbide cutting tools was recently built by the Acme Machine Tool Co., 4955 Spring Grove



Two Hyro Industrial Furnace Units for Heat-treating in Pot Solutions and then Automatically Quenching and Discharging



Acme Turret Lathe Designed to Use Tungsten-carbide Tools in Machining Phosphor-bronze Bearings

Ave., Cincinnati, Ohio. The machine was primarily constructed for finishing phosphor-bronze bearings. It comprises the "Duo Control" turret lathe equipped with a special drive. This drive consists of a 25-horsepower adjustable-speed motor which is connected directly to the spindle by a flexible coupling, thus eliminating intermediate gears. Full-load spindle speeds from 300 to 1200 revolutions per minute are obtainable through rheostats. Starting, stopping, and braking are controlled electrically.

The spindle is equipped with a double set of Timken tapered roller bearings on the nose end, and with a floating roller bearing at the rear, to suit high-speed operation. There is a positive lubricating system for the spindle bearings. An oil-pump driven by a constant-speed motor, which also provides power for the turret quick motion, forces the lubricant through a "Purolator" oil filter.

Twelve independent reversible feed changes are obtainable for each carriage through mechanisms located in the different aprons. This arrangement results in concentration of the control levers. The feed changes are made by means of sliding gears mounted on squared shafts which revolve in anti-friction bearings. The mechanisms are entirely enclosed and revolve in oil.

The main carriage can be furnished with a fixed center or a cross-sliding turret of either hexagon or flat type. A power rapid traverse is incorporated for the longitudinal movement of this unit. Taper and chasing attachments of the engine lathe type can be furnished.

MOLINE HYDRAULIC CYLINDER LAPPING MACHINE

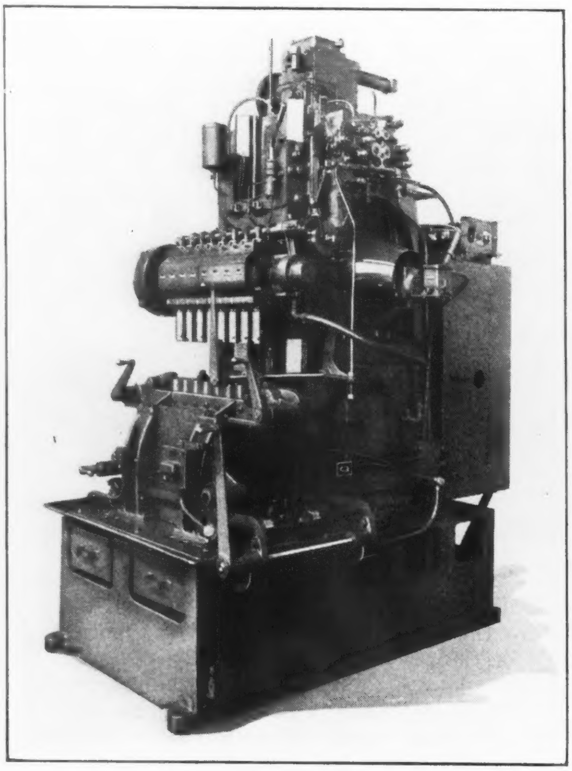
The latest addition to the line of automatic cylinder lapping or honing machines built by the Moline Tool Co., Moline, Ill., is the No. 11 machine here illustrated. One of the new features embodied in this equipment is the main drive for the spindles. After the reciprocating rail has completed a predetermined number of strokes, and at the instant that it reaches the top of the withdrawal stroke, the switch is automatically tripped to reverse the main driving motor. This causes a braking action to be exerted until the motor and spindles are brought to a standstill. The instant that the motor stops, a switch automatically shuts off the current and prevents the motor from running in the reverse direction. Thus the hones, in case they are not of the type that can be adjusted while the spindles are running, can be adjusted for wear before beginning the next cycle.

This main driving motor is located inside the column and drives an intermediate shaft on the rail through an enclosed silent chain at the left-hand side of the machine. The speed change gears, enclosed in the case at the left-hand end of the rail, transmit the power to the long spiral shaft. The latter, in turn, drives the spindles through the medium of spiral gears.

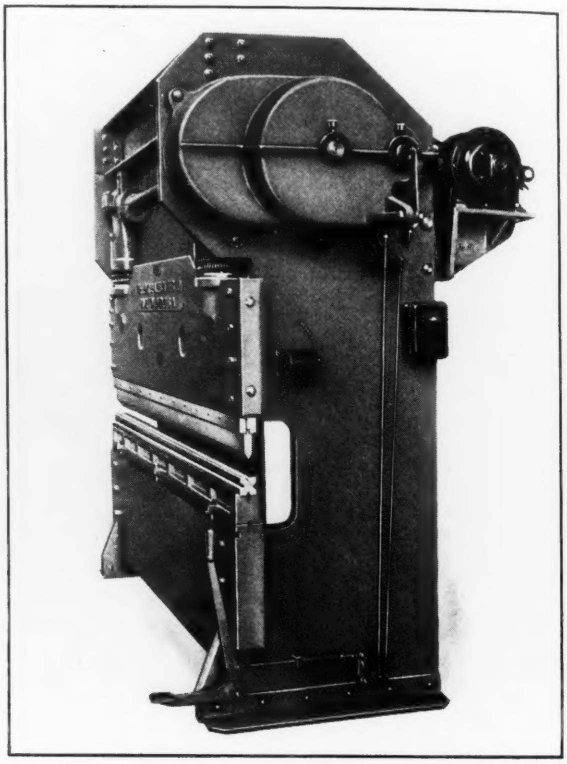
A start and stop push-button control for the main driving motor is located on the front right-hand corner of the jig. This station is totally enclosed, so as to prevent kerosene from entering and causing trouble. By means of this control, the rotation of the spindles can be started or stopped at any part of the machine cycle.

An Oilgear pump for reciprocating the rail is located on top of the column and driven by a separate motor. An enclosed start and stop push-button control for this motor is located on the front left-hand corner of the jig. The reciprocation of the rail is automatically stopped when it reaches the top of the withdrawal stroke, but the reciprocation can be stopped at any time by means of a hand-lever on top of the jig.

Kerosene is supplied to the hones by a centrifugal pump at the left-hand side of the column. The pump is driven by the main motor; consequently, when this



Moline Hydraulic Lapper which is Equipped with a Braking Motor



Long & Allstatter Power Press Brake of Steel-plate Construction

motor is stopped, upon the completion of a cylinder block, the supply of kerosene also ceases. A one-shot lubricating system is provided for the entire reciprocating rail assembly. Rollers facilitate moving the cylinder blocks in and out of the jig.

LONG & ALLSTATTER POWER PRESS BRAKE

A steel power press brake has recently been produced by the Long & Allstatter Co., Hamilton, Ohio, in which the housings, slide, and base are made from open-hearth steel rolled plates. The housings are 2 3/4 inches thick, the slide 3 inches, and the base 4 1/2 inches. The flywheel is mounted on roller bearings. The clutch is of the multiple-disk design, with plates having asbestos friction linings. An adjustment insures uniform pressure at all points on the disks. Through the use of a friction brake, operated by means of the friction-clutch foot- and hand-levers, the slide can be stopped at any point of the stroke.

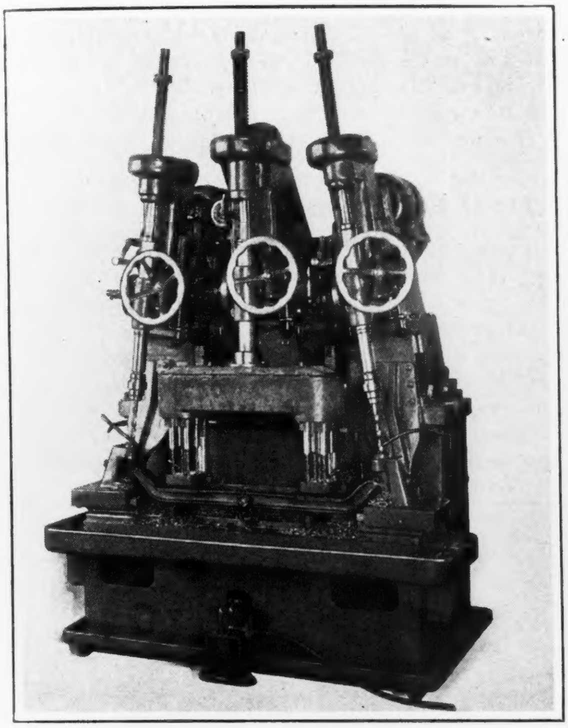
When the machine is motor-driven, power is delivered by means of a V-belt drive from a pulley on the armature shaft to the flywheel. Adjustments of the slide are accomplished by means of a small high-torque motor through worm-gearing. A pointer and graduated steel scale on the right-hand connection indicates the positions to which adjustments are made. This feature is valuable in setting up dies for repetition work.

Longitudinal slots milled the full length of the base, both at the front and back, provide for attaching gages, fixtures, brackets, or similar appliances. A cast-iron sub-block accommodates practically all types of dies used on this kind of machine. The standard sizes of this machine are made with the following width between housings: 4 feet 6 inches, 6 feet 6 inches, 8 feet 6 inches, and 10 feet 6 inches. The length of the slide and base is 6, 8, 10, and 12 feet, respectively. The stroke of each size is 3 inches, and the slide adjustment, 6 inches. Thirty strokes are made per minute.

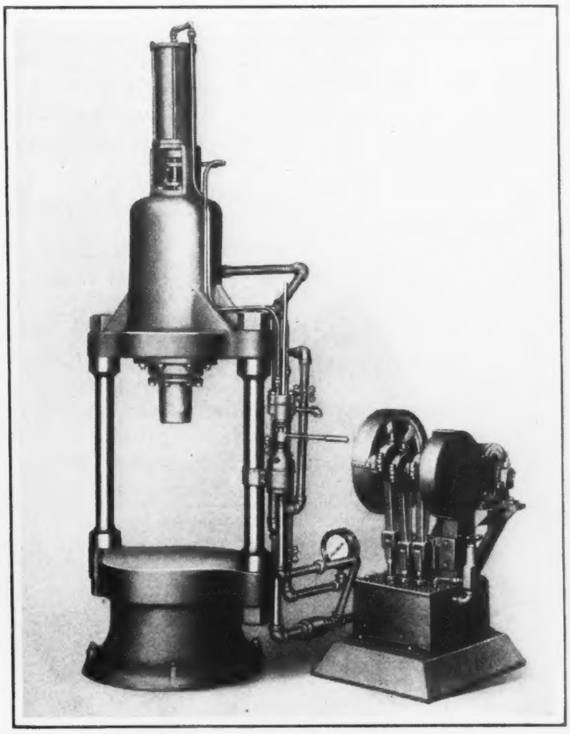
BARNES DRILL CO'S. FRONT AXLE DRILLING MACHINE

The base, column, and table of a front axle drilling machine built by the Barnes Drill Co., 814 Chestnut St., Rockford, Ill., are combined in one casting to obtain maximum strength and rigidity. The particular job illustrated is an axle for a 1 1/2-ton truck, and the operation consists of drilling the spring-pad and king-pin holes.

The fixture that carries the bushings for the king-pin holes is attached to the wedge block of each outside spindle or gang head and travels laterally with the movement of the sliding head. This movement is pneumatically controlled through a foot-pedal at the front of the machine. The heads move outward for reloading and inward



Machine Built by the Barnes Drill Co. for Drilling and Reaming Front Axles



National Press Operated by High-speed Air Cylinder and Hydraulic Pump

for chucking the ends of the axle forging, bringing the twist drills to the center of the boss and, at the same time, holding the forgings securely during the drilling operation. The lateral adjustment also compensates for variations in the length of different forgings.

On the center head is mounted a special aluminum auxiliary head which carries two clusters of five auxiliary spindles each, for drilling the spring-pad holes. Equalizing rack-bars eliminate strains or deflections in case the twist drills should become duller in one cluster than in the other. Even if all the twist drills were left out of one cluster, and the head were used with the five drills in the opposite end, there would be no tendency for the unit to cock or bind.

Handwheels at the front of the machine facilitate adjustments in setting up. Quick-change tools are used for the king-pin holes and slip bushings are employed in the fixture. These bushings can be removed conveniently for reaming the holes. Each gang head is driven by an individual motor, and a coil spring mechanism automatically returns each head spindle when the lowest depth of feed has been reached. A brake on the internal feed-gear stops the upward spindle movement as soon as the drills back out of the work and are still in the bushings. Thus no rapid approach of the spindles is necessary.

NATIONAL HYDRAULIC PRESS

A hydraulic press designed for such operations as straightening distorted castings, forgings, etc., as well as for pressing gears, pinions, sprockets, and wheels on and off shafts, and pressing in bushings and similar work, has recently been developed by the National Brake & Electric Co., subsidiary of the Westinghouse Air Brake Co., Milwaukee, Wis. This press is actuated by a vertical triplex hydraulic pump, together with an auxiliary high-speed air cylinder. The hydraulic pump is designed to deliver a pressure of 4000 pounds per square inch, which, in turn, develops a pressure of 150 tons on the press ram.

The air cylinder is mounted on top of the hydraulic cylinder and serves as an auxiliary to the hydraulic pump. It furnishes power for driving the ram at the high free-operating speed of 144 inches per minute on the down stroke until the ram comes into contact with the work. Then the full pressure of the hydraulic pump is automatically applied to the ram so that the remainder of the down stroke is made under the full-load pressure at a speed of 5 inches per minute. The high-speed air cylinder is likewise used to return the ram at a speed of 65 1/2 inches per minute.

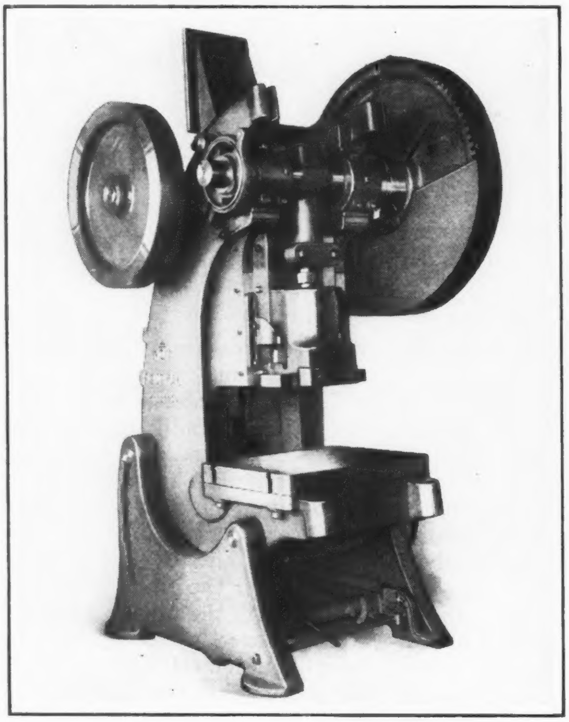
The entire operation of the press is controlled through a single lever of a valve which governs the air supplied from the shop air line to the high-speed cylinder as well as the oil delivered by the hydraulic pump to the hydraulic cylinder. There is a hydraulic safety valve which can be adjusted for any pump pressure up to 4000 pounds per square inch. This is of advantage when it is desirable to reduce the power of the ram.

The machine can be furnished with a transfer table attachment for use when the material is too heavy for manual handling. A special demountable extension table can also be furnished to facilitate straightening long castings, shafts, etc. The press can be furnished equipped for either a belt or an electric motor drive.

FEDERAL OPEN-BACK INCLINABLE PRESS

A No. 7 press has been added to the line of open-back inclinable punch presses built by the Federal Press Co., Elkhart, Ind. Although a geared type is shown in the illustration, this press is also made in a flywheel type. It has a capacity of 75 tons and a total weight of 14,000 pounds. Timken roller bearings are provided in the back-gear bracket and a bronze removable bushing in the flywheel. The crankshaft is 4 3/4 inches in diameter at the main bearings and 5 1/2 inches at the crankpin. The crankshaft is lubricated by large oil pockets in the caps from which felt pads carry the oil to the shaft.

The bolster measures 28 by 36 inches, and there is 13 1/2 inches of die space from the bed to the ram with the stroke down and the adjustment up. The machine illustrated is arranged for a direct motor drive, a bracket being attached to the top of the machine so that the motor can drive the balance wheel direct.



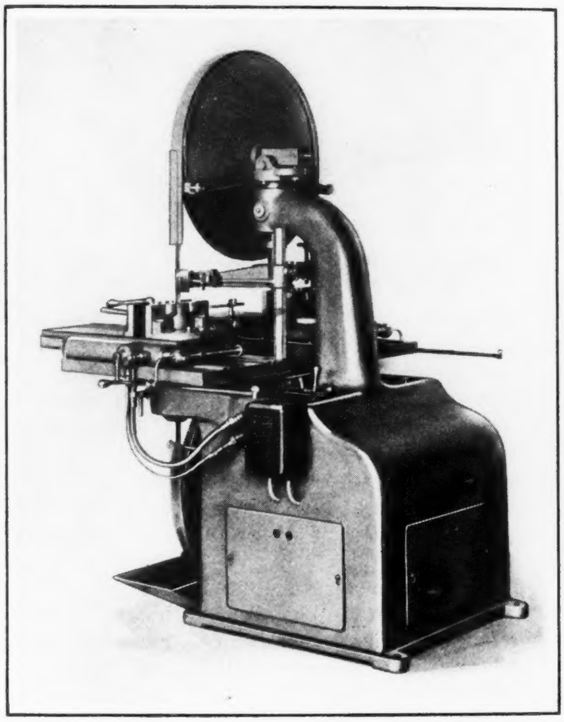
Federal Inclinable Press of 75 Tons Capacity

HYDRAULIC FEED FOR LAIDLAW BAND SAWS

Metal-cutting band saws built by William Laidlaw, Inc., Belmont, N. Y., may now be equipped with a low-pressure hydraulic feed. This feed mechanism consists of a small rotary-type piston pump, oil reservoir, pressure-regulating valve, relief valve, pressure gage, cylinder, piston, control valve, and piping. The pump and reservoir are housed in the base of the machine, the pump being direct-connected to the main drive shaft.

It has been found that a pressure of about 50 pounds per square inch is all that is necessary for ordinary cutting, but provision is made for obtaining a pressure of 100 pounds per square inch. The machine illustrated is of the double-acting type and necessitates the use of two cylinders. These cylinders are mounted in a stationary position on top of each table beside the movable carriage, the piston-rod being direct-connected to the latter.

The hydraulic mechanism is so designed that when the control valve handle is moved to its extreme position, the ports are opened wide to effect a rapid traverse for the carriage return. An adjustable tappet closes the control valve and stops the feed when the carriage has traveled a predetermined distance, but owing to the low pressure used, no damage can be done, even though this tappet is not employed. A stop prevents the saw from cutting into the vise.



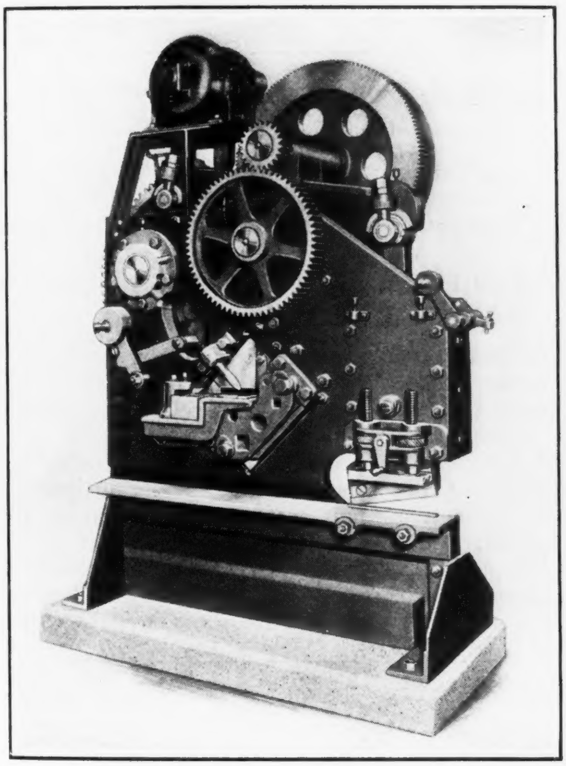
Laidlaw Hydraulic Double-cutting Band Saw

BUFFALO UNIVERSAL SHEARS

Three larger sizes, the Nos. 2 1/2, 3 1/2, and 4 1/2, have been added to the line of universal

shears built by the Buffalo Forge Co., 144 Mortimer St., Buffalo, N. Y. These additional sizes are of the same electrically welded "Armor-Plate" frame construction as the smaller machines. One eccentric operates both the shear and the bar cutter during a single revolution, but not at the same instant. This prevents overloading the machine and yet permits of working at both ends at the same time.

The shear blades are reversible and are provided with four cutting edges. The bar cutter is the same as on other shears built by the company. Structural steel angles can be cut to a miter without inclining the stock. The No. 2 1/2 shear will cut plates up to 3/4 inch through the center and round bars up to 2 1/4 inches; the No. 3 1/2 shear will cut up to 7/8-inch plate through the center and round bars up to 2 1/2 inches; and the No. 4 1/2 shear will cut 1 1/4-inch plate through the center and round bars up to 3 inches. Special knives can be provided for cutting structural steel shapes.



One of Three Larger Sizes Added to the Line of Buffalo Universal Shears

MILLHOLLAND AUTOMATIC INDEXING DRILLING MACHINE

An automatic indexing drilling machine which works in two planes simultaneously and is suitable for a wide range of production work has been developed by the Millholland Sales & Engineering Co., 1833 Ludlow Ave., Indianapolis, Ind. This machine can index up to 720 times per hour. It is designed for drilling, reaming, countersinking, burring, spot-facing, milling, hollow-milling, and light broaching (with non-rotating spindles). The table is provided with either six, eight, or twelve stations, and up to four pieces can be accommodated at each station, depending upon the size of the work being handled.

In many cases, multiple fixtures are made up on a common base which is mounted on the top of the index table. A special form of collet chuck is used for second-operation screw machine work. This chuck has ample chip clearance through to the base. The machine can be readily arranged for new jobs by changing gears, plate cams, work fixtures, and multiple drill heads. Wide ranges of speeds and feeds are available.

The matter of chip removal was given careful consideration in designing the machine. The fixtures are provided with generous channels which lead into a round chip and coolant pan. This pan is swept by a paddle attached to the index table, the paddle pushing the chips down through a spout, together with the coolant, when used. They fall into a strainer basket in the sump box. The coolant pump is equipped with an individual motor drive.

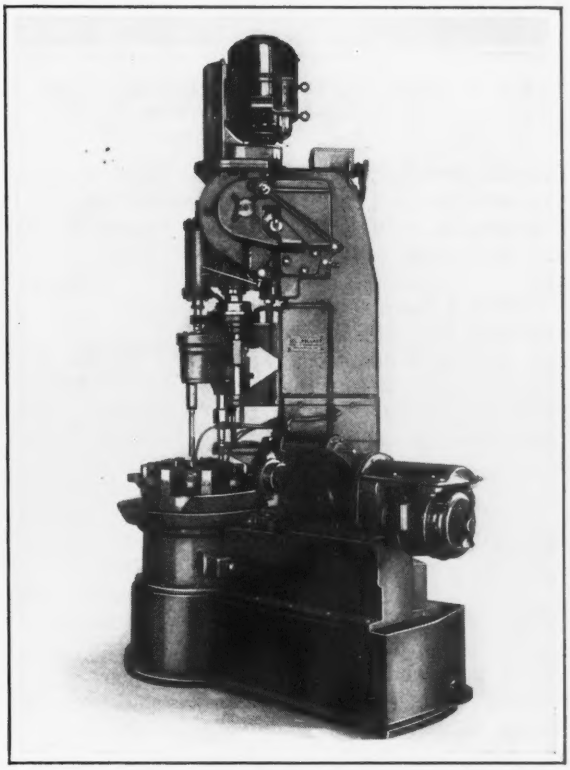


Fig. 1. Millholland Drilling Machine which can be Indexed 720 Times per Hour

The machine is actuated by a No. 5 automatic power unit with a 5- or 7 1/2-horsepower motor attached. This power unit is mounted vertically. It drives and feeds the multiple drill head, drives the automatic indexing mechanism, and feeds the horizontal units. The motors on the

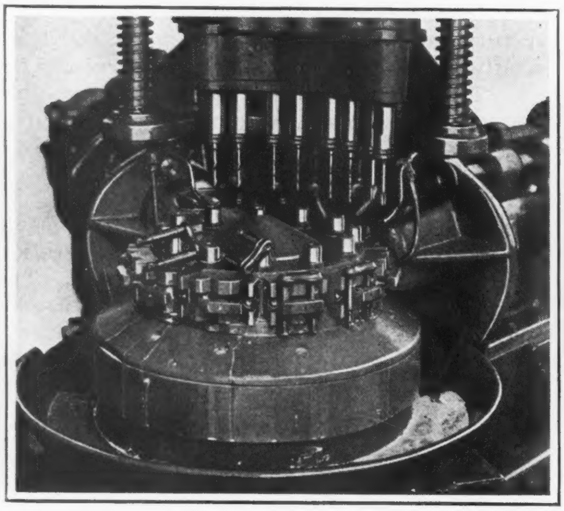
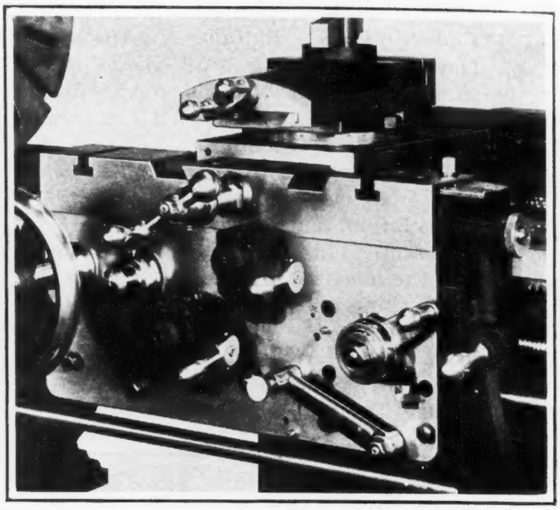


Fig. 2. Millholland Drilling Machine Set up for Machining Spring Shackles



Bradford Lathe Apron with "Kant-Slip" Feed Mechanism

horizontal units provide only for the rotation of the respective tool-spindles. Both the vertical and horizontal units are standard.

In Fig. 2, the machine is shown arranged for drilling and reaming all the holes in a spring shackle and for burring cross-holes on one side. The rate of production is 600 pieces per hour.

BRADFORD "KANT-SLIP" APRON FEED MECHANISM

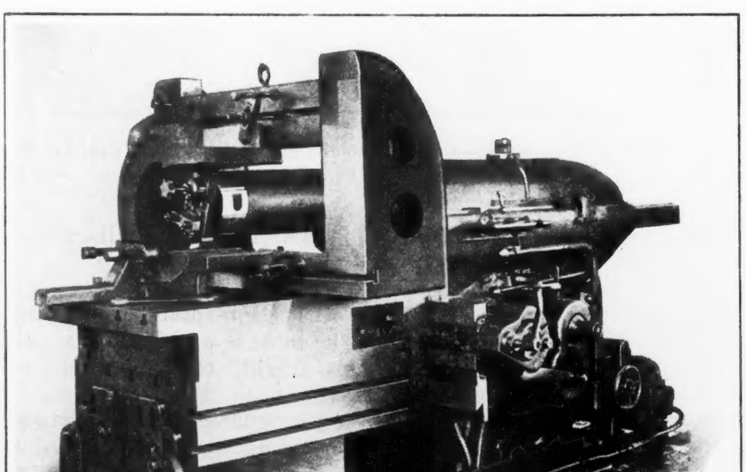
The full line of standard engine lathes of from 14 to 48 inches swing built by the Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio, is now provided with a "Kant-Slip" apron feed mechanism. The advantages claimed for this mechanism include positive disengagement as well as engagement; smooth engagement and disengagement without jolts or jerks; ease and quickness of operation, a partial turn of the handle sufficing for instantaneous engagement or disengagement; compactness, in combination with stems and bearings of generous size; and automatic take-up of wear.

This mechanism will operate for a long period without adjusting, and when an adjustment is finally necessary, it is easily effected by means of a nut and lock-nut. A feature of the mechanical details is an oscillating eccentric shaft and a convenient operating handle. This eccentric shaft effects the engagement, disengagement, and locking of the cone-type friction members.

OHIO "SUPER-DREADNAUGHT" SHAPER FOR RAILROAD SERVICE

Special attachments made for the 36-inch Ohio "Super-Dreadnaught" shaper marketed by Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts., Chicago, Ill., adapt this machine for various operations on locomotive parts. In the illustration, the shaper is shown equipped with a special extension head, which is used with either a single or a double driving-box attachment to facilitate machining the crown brass fit and cellar seat of any driving-box.

Other attachments adapting the machine for locomotive repair work include a fixture for machining the shoe and wedge fit; a rod brass attachment; a shell or crown brass attachment; a chuck for shoes, wedges, cross-



"Super-Dreadnaught" Shaper Equipped for Locomotive Repair Work

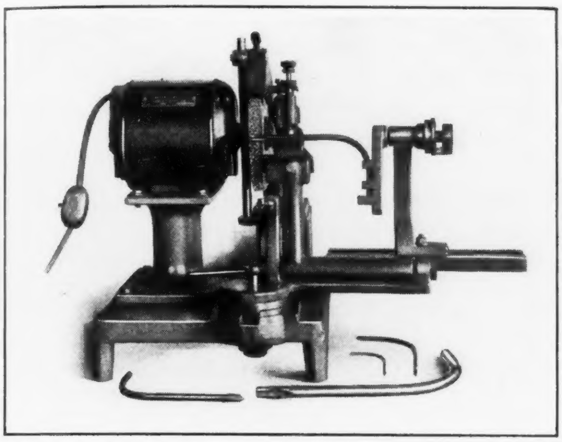


Fig. 1. Bent-tap Sharpening Machine Developed by the Wells Mfg. Co.

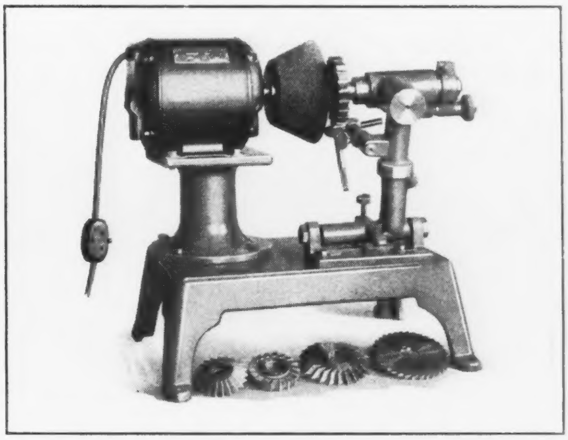


Fig. 2. Machine for Sharpening Milling Cutters, Counterbores, and Formed Tools

heads, etc.; and a fixture for machining electric locomotive driving-wheel boxes.

The construction of this machine was described in an article published in October, 1929, MACHINERY, page 115. All of the control levers are grouped within a radius of 12 inches, and are easily reached from the operator's position. Lubrication of all parts is insured by a force-feed system.

WELLS BENT-TAP AND CUTTER SHARPENERS

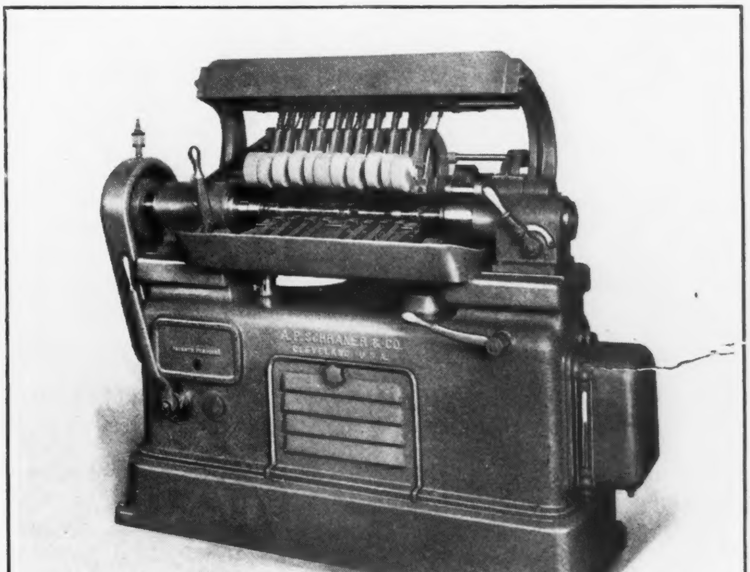
Fig. 1 shows a machine developed by the Wells Mfg. Co., P. O. Box 613, Greenfield, Mass., to facilitate sharpening bent-shank taps, this operation being rather awkward to perform by hand on account of the shape of the taps. It is claimed that the machine will grind a tap with the correct eccentric relief so that each tooth will do its share of the work. The machine does not depend upon the skill of the operator for accuracy, the tap being guided by a relief cam. Bent taps up to 3/4 inch can be handled. The weight of the machine is 72 pounds.

Another machine produced by the same concern for sharpening straight- and spiral-flute milling cutters, side mills, counterbores, and circular forming tools is illustrated in Fig. 2. This machine is equipped with a saucer-wheel for sharpening formed cutters and forming tools, but a cup-wheel is used for all other types of cutters. A flat relief is ground in place of the usual concave relief.

The outside diameter of all regular milling cutters is ground by sliding the cutters along a bar past the wheel, the cutting edge being guided by a tooth-rest. End-mills are held in a sliding collet bar and slid past the wheel in the same way. The swivel head of the machine can be adjusted to suit cutters of any angle. The wheel is mounted directly on the motor shaft, and can be readily changed.

SCHRANER CAMSHAFT BURRING AND POLISHING MACHINE

Rolled abrasive cloth is used for burring and polishing automobile camshafts in a machine recently developed by A. P. Schraner & Co., 3336 Payne Ave., Cleveland, Ohio. There are two sets of rolls, an upper and a lower. The illustration, which is a front view of the machine, shows the upper rolls in place. These rolls are carried in brackets fastened to upper shoe carriers.



Schraner Camshaft Burring and Polishing Machine

There is a carrier and shoe for each cam and bearing of the camshaft, the shoes being specially shaped to suit the job. The cloth is fed through the shoes and back to wind-up reels on a shaft at the rear of the machine.

The upper shoe carriers are pivoted on a cross-shaft and are raised and lowered by a hydraulically operated yoke. Tension springs between the yoke and the carriers furnish the necessary pressure to the work and hold the shoes against the cam contours. About 1/4 inch of new cloth is supplied automatically for each camshaft finished.

The lower shoes are arranged in the platen directly beneath the work, and the lower cloth rolls are carried in brackets at the rear of the machine. The lower shoes differ somewhat from the upper ones in that the sides are beveled to fold the cloth up along the edges for the purpose of burring the corners of the cams and bearings.

In operation, the work is loaded in the machine between the headstock and tailstock, and then the upper shoes are lowered into the working position. A clutch is next operated to rotate the work at about 150 revolutions per minute. The work is oscillated sidewise at the same time to provide a lapping movement. The machine stops automatically at any predetermined time, the time required for the operation ranging from twenty-five to fifty seconds.

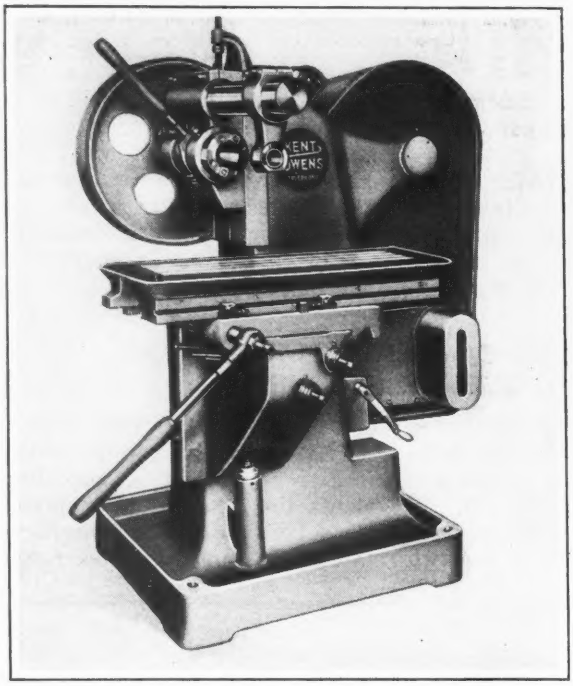


Fig. 1. Kent-Owens Improved Milling Machine with Variable-speed Drive

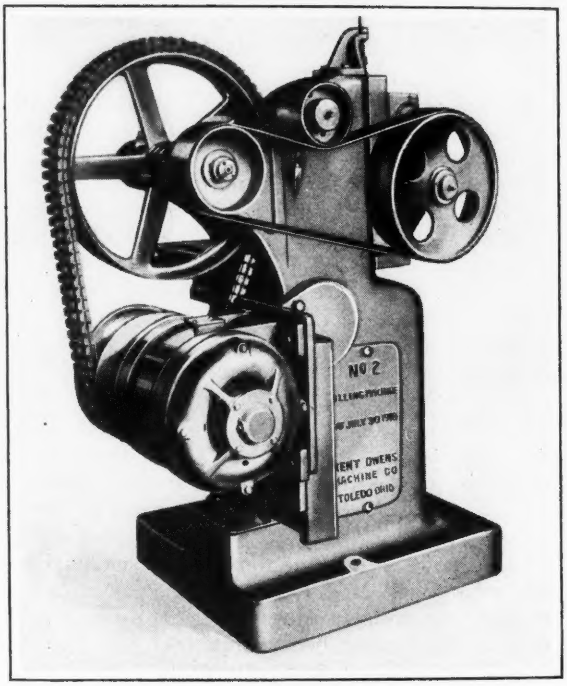


Fig. 2. Variable-speed Drive of Milling Machine Illustrated in Fig. 1

KENT-OWENS MILLING MACHINES WITH VARIABLE-SPEED DRIVE

The Nos. 1 and 2 heavy-duty milling machines manufactured by the Kent-Owens Machine Co., 958 Wall St., Toledo, Ohio, are now equipped with a variable-speed drive which provides any required spindle speed over a wide range. This drive makes the machines suitable for use on both small-lot and production work.

As may be seen from Fig. 2, power is transmitted from the motor to the back-shaft through a combination flat and vee belt. This belt rides on its angular edges between two cone disks on the motor shaft, and on its inside face on a plain pulley on the back-shaft. The cone disks on the motor shaft are continually pressed toward each other by a coil spring, thus tending to force the belt to the greatest diameter.

Speeds are changed by turning the handle at the lower part of the guard on the front side of the machine, which moves the motor toward or away from the back-shaft. As the motor is adjusted toward the back-shaft and the center distance becomes less, the coil spring forces the V-belt toward the outer circumference of the cone disks and the spindle is driven at a higher speed. Similarly, moving the motor away from the back-shaft causes the V-belt to ride upon a smaller diameter of the cone disks and thus decreases the spindle speed. A spindle variation of 3 to 1 is obtained by this adjustment, and the variation is increased to 10 to 1 by interchanging the pulleys on the spindle and back-shaft. The endless belt used is made of woven cord vulcanized in rubber.

The No. 1 miller has also been increased in range, and other changes have been made to improve the convenience of operation and rigidity. The No. 2

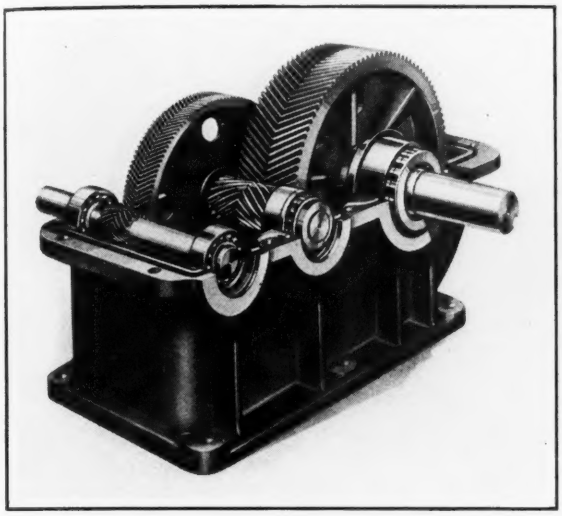


Fig. 1. "Titan" Herringbone-gear Double-reduction Speed Reducer

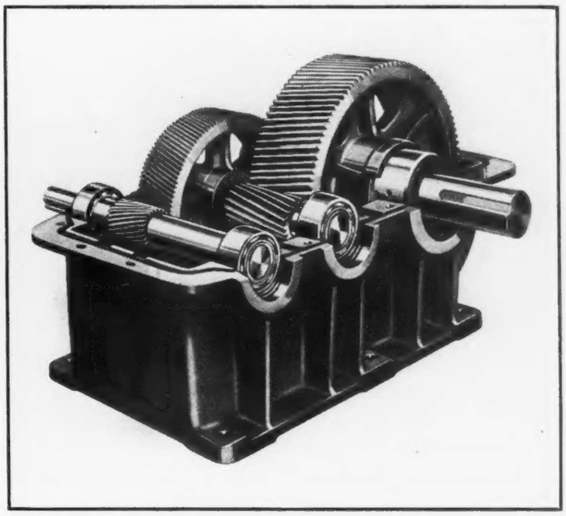


Fig. 2. Helical Double-reduction Speed Reducer of the "Titan" Line

machine is now equipped with an idler in the spindle drive to keep the belt under proper tension and thus insure ample pulling power for all positions of the head.

FOOTE BROS. SPEED REDUCERS

A line of anti-friction speed reducers known by the trade name of "IXL Titan" is being placed on the market by the Foote Bros. Gear & Machine Co., 111 N. Canal St., Chicago, Ill. These reducers are available with either herringbone or helical gears. Both styles are identical in design except for the gears and slight bearing modifications. A herringbone-gear speed reducer is shown in Fig. 1, and a helical-gear type in Fig. 2.

S K F bearings are provided for the high-speed shaft of the reducers, and Hyatt roller bearings for the slow-speed shaft. The reducers are made in both single- and double-reduction types. The ratios are standard, ranging from 2.87 to 9.9 in the single-reduction units and from 9.95 to 96.2 in the double-reduction units.

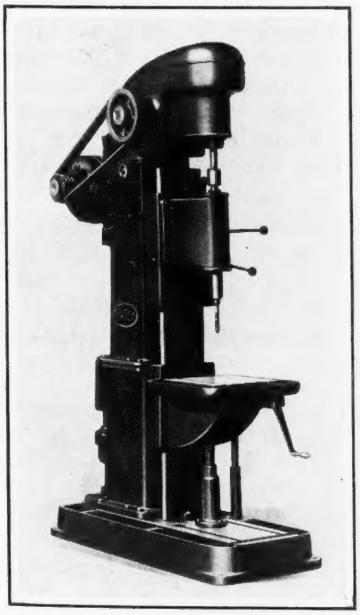


Fig. 1. Natco Single-spindle Drilling Machine with Semi-automatic Hydraulic Feed

NATCO SEMI-AUTOMATIC HYDRAULIC DRILLING MACHINE

A small vertical single-spindle drilling machine equipped with a semi-automatic hydraulic feed is being introduced on the market by the National Automatic Tool Co., Richmond, Ind. This machine, which is shown in Figs. 1 and 2, has a simplified means of instantly and positively controlling the head. Either single- or multiple-spindle drill heads can be arranged on the flat slide. The machine has been designed with a view to enabling production to be increased readily when the purchase of multiple or special equipment is inadvisable.

The operating valve trip mechanism is of the load-and-fire type. It is operated semi-automatically through adjustable dogs which cause the head to go through its cycle of rapid traverse to the work, feed for the drilling operation, and rapid traverse away from the work. The head stops at the end of the stroke. The operator starts the cycle by means of a manually operated hand-lever. Power feeds of from 0 to 15 inches per minute are avail-

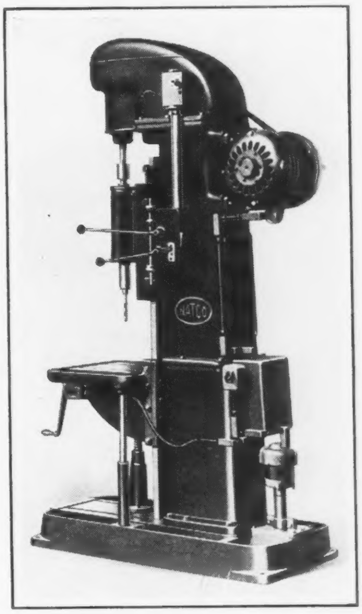


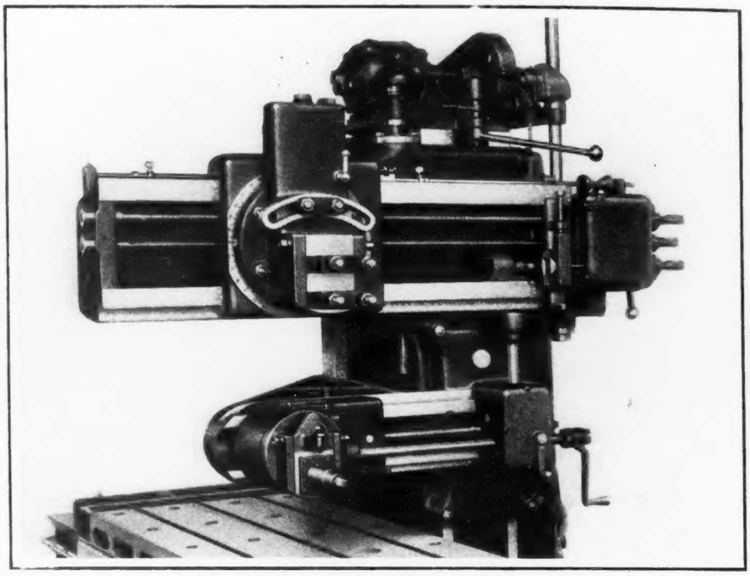
Fig. 2. Operating Side of the Natco Single-spindle Drilling Machine Shown in Fig. 1

able, and the rapid traverse is at the rate of 95 inches per minute.

Near the starting lever there is a second control lever which is used for emergency stopping or for changing from semi-automatic to hand operation. The movement of the head may be stopped at any time during the cycle by means of this lever. The operator can then move the head independently of the automatic trip-dogs by the use of the first lever. This feature is valuable in setting up the machine.

Hydraulic pressure is supplied by a pump which is protected by a relief valve set at 300 pounds per square inch. The cylinder is of the pull type, and provides a total feeding pressure of 3400 pounds when the pump is under maximum load. The hydraulic operating valve is of the balanced piston type, and is located above the oil reservoir, thus eliminating causes of leakage. All piping for the hydraulic system is sealed within the column and neck of the machine.

Power is supplied by a five-horsepower motor which transmits the drive through multiple V-belts. Pick-off gears are regularly furnished to provide any spindle speed from 100 to 1300 revolutions per minute. The machine has a capacity for drilling a 1 1/4-inch hole through steel at the rate of 75 feet per minute, with a feed of 0.008 inch per revolution.



Rockford Shaper-planer Equipped with Attachment for Machining Locomotive Driving-boxes

RAILROAD SHOP ATTACHMENT FOR ROCKFORD SHAPER-PLANER

An attachment for machining locomotive driving-boxes has recently been developed by the Rockford Machine Tool Co., 2412 Kishwaukee St., Rockford, Ill., for application to the hydraulic shaper-planer built by that concern. This attachment is in the form of a side-head, which is anchored to the L-type rail and is rigidly supported at the back by being clamped to the rear of the column. The construction is shown in the illustration. Both circular and horizontal feeds are provided for the tool.

As the hydraulic shaper-planer is built with a stroke of 42, 66, or 90 inches, one or more driving-boxes can be machined at the same time. Both the seat for the brass and the bearings for the oil cellars are machined at one set-up. The advantage of this attachment in machining driving-boxes is that all surfaces are finished from the same center line. Both hand and power feeds are provided, as well as a rapid traverse in all directions. The entire unit can be easily removed at any time and replaced by a standard side-head.

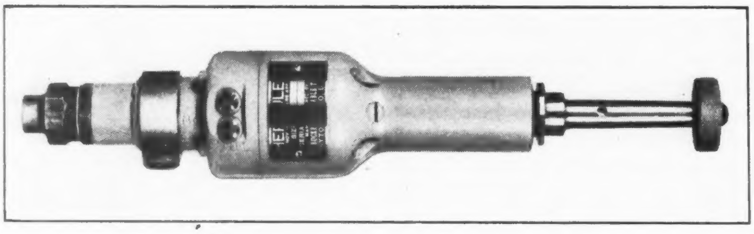


Fig. 1. Buckeye Portable High-speed Grinder

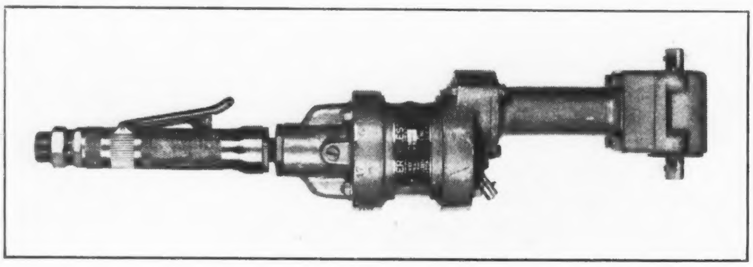
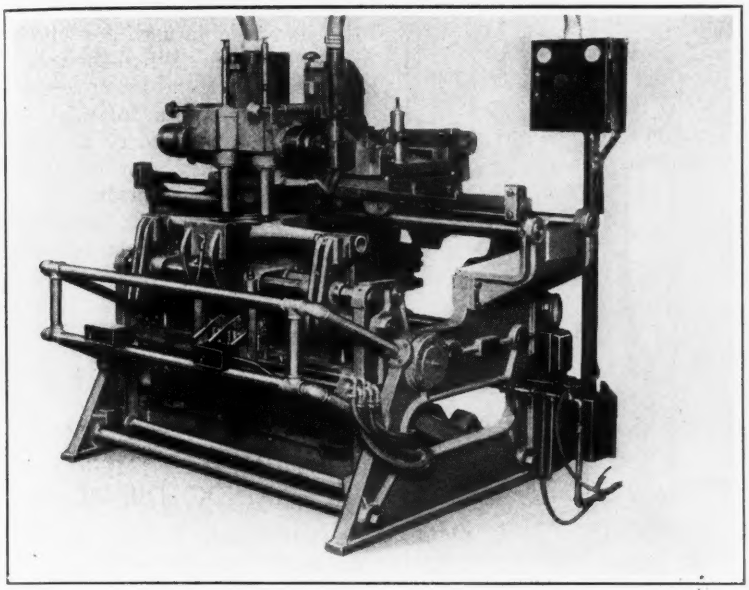


Fig. 2. Right-angle Nut and Cap-screw Driver

BUCKEYE PORTABLE GRINDER AND NUT-SETTER

Recent additions to the line of equipment manufactured by the Buckeye Portable Tool Co., Dayton, Ohio, consist of the high-speed grinder shown in Fig. 1 and the nut-setter illustrated in Fig. 2. The grinder is especially adapted for use with small emery wheels, emery pencils, rotary files, etc., and can be used in close quarters. It weighs only



Lincoln Welding Machine Designed for Producing Automobile Rear-axle Housings

3 1/2 pounds and runs at a free speed of 22,000 revolutions per minute. This tool is provided with a throttle and rear head in one piece. The throttle can be operated by a touch of the thumb. With the extension-shaft spindle off, this tool measures 12 inches.

The nut-setter is of right-angle design and is especially suitable for close-quarter driving. It is intended for driving 1/2-inch nuts and 5/8-inch cap-screws. This tool is 21 inches long and weighs 11 1/4 pounds.

LINCOLN WELDING MACHINE FOR REAR-AXLE HOUSINGS

An automatic machine designed for manufacturing automobile rear-axle housings by the "Electronic Tornado" process of carbon arc welding has been designed by the Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio. This machine consists of automatic welding heads and clamps for holding the housings. The welding heads are driven across the seam and returned to the starting position by automatically controlled electric motors.

The housings are placed in this machine as they come from the presses, formed in two parts. A jig that holds the housings is tilted downward away from the welding heads toward the operator while the housings are being inserted. Then the jig is swung into position and the two arcs are struck simultaneously. The welding heads travel across the seam in opposite directions. At the extreme ends of the housing, the heads strike a limit switch, which automatically interrupts the arc and returns the heads to their original position, ready to repeat the cycle. The housing is then turned through 180 degrees to weld the reverse side. A production of about twenty-five housings per hour is obtained with this equipment.

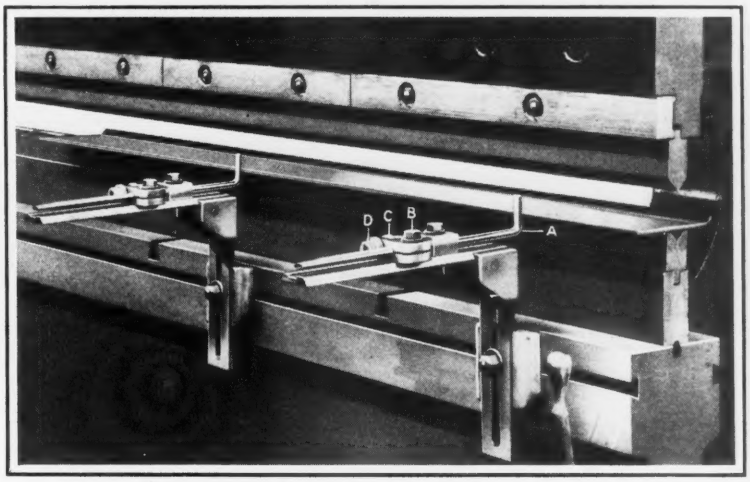
OSTER-WILLIAMS PIPE THREADER AND REAMER

A "Chip Chaser" threader for pipe from 1/2 to 1 1/4 inches, and a "Chip Chaser" reamer for pipe from 1/8 to 3/4 inch, have been brought out by the Oster Mfg. Co. and the Williams Tool Corporation, Cleveland, Ohio. The threader is built on the same principle as other sizes made by these concerns, and has an improved open type of die-head that provides unusual chip clearance and makes it easy to oil the pipe. This threader has four die-heads and a ratchet handle. The ratchet is so placed that the operator can reverse its action or put it in neutral with an easy flick of the thumb.

The reamer fits the No. 00 ratchet handle. It has three reaming blades, and is so constructed that it can be instantly attached to the ratchet handle or removed.

UNIVERSAL GAGES FOR CINCINNATI PRESS BRAKES

Universal gages with a micrometer adjustment are now offered as standard equipment on press brakes built by the Cincinnati Shaper Co., Cincinnati, Ohio. These gages have full horizontal and vertical adjust-



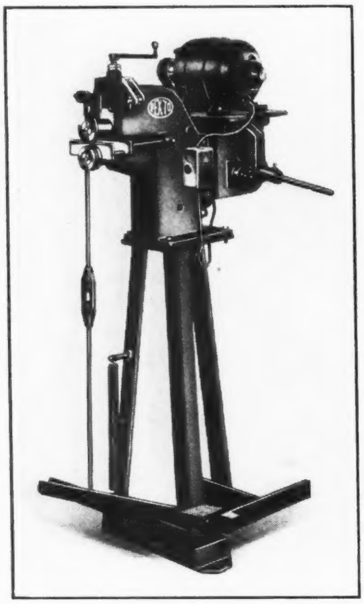
Universal Gages with Micrometer Adjustment Applied to Cincinnati Press Brakes

ments and may be used either on the front or rear of the machine. The horizontal gage rod *A* can be moved quickly to the approximate gaging position and clamped in place by means of cap-screw *B*. A final adjustment is then made through micrometer nut *C* and lock-nut *D*.

These gages can be set for forming wide or narrow sheets either up or down. They can also be used as adjustable two-step gages for making both bends of a channel successively with only one handling of the sheet. Gage rod *A* may be replaced with any 1/2-inch diameter rod. This rod can be notched for use as a step gage or bent to any desired shape for gaging a special bend.

"TOGGLE BUG" PORTABLE DRILL

A portable drilling outfit known as the "Toggle Bug" which has been designed primarily for use in metal fabrication has been placed on the market by the Guibert Steel Co., 1716 Youghiogheny Ave., Pittsburgh, Pa. This drill can be easily rolled on a steel surface with one hand, as it is counterbalanced. When the equipment is being used for drilling, reaming, or countersinking, the tool is held in a perpendicular position relative to the work by means of an adjustable leg. The equipment is designed for drilling holes up to 1 1/2 inches in diameter. The over-all dimensions are 8 feet long, 2 feet 2 inches wide, and 3 feet 1/2 inch high without the bit. The gross and stripped weights are 1355 and 432 pounds.

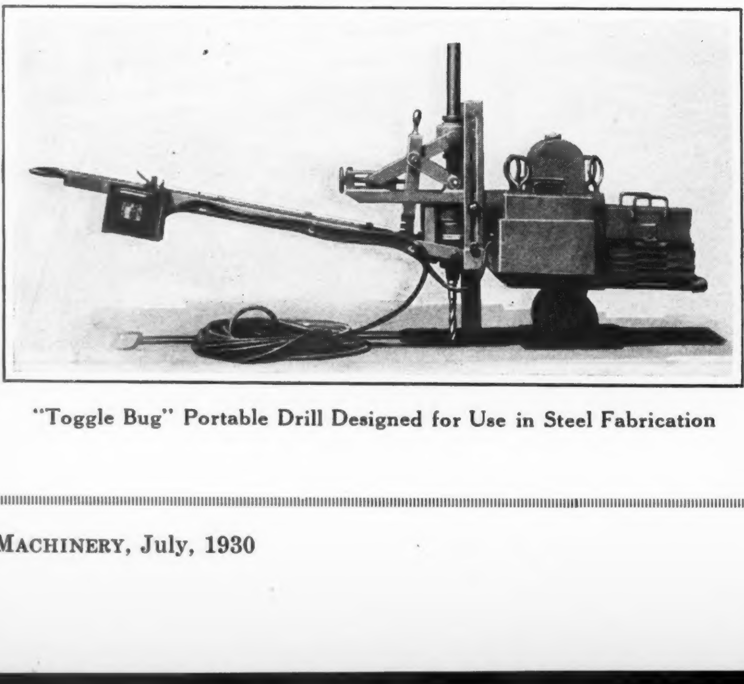


"Pexto" Motor-driven Rotary Machine

"PEXTO" MOTOR-DRIVEN ROTARY MACHINE

Motor-driven equipment of the construction shown in the illustration has been placed on the market by the Peck, Stow & Wilcox Co., Southington, Conn., for such operations on sheet metal as burring, wiring, elbow-edging, crimping, turning, beading, and slitting. Rolls for special operations can also be provided. This machine is made in two sizes, the smaller of which has a capacity for handling metal up to No. 18 gage, and the larger, up to No. 16 gage.

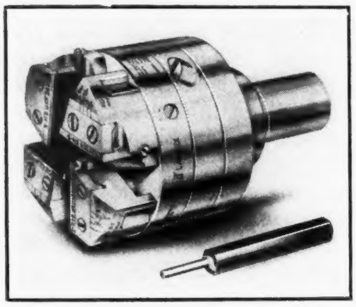
An important feature of this machine is the clutch control. The upper roll can be depressed by means of a crank-screw and the foot-treadle used for operating the clutch. When the treadle is attached to a lower connection, the rolls run forward, and when it is fastened to an upper connection, they run backward. Should it be preferable to use the foot-treadle for depressing the upper roll, this can be easily arranged. Starting of the rolls in either direction and stopping are then controlled by merely manipulating the hand-lever. The clutch is locked automatically in each position.



"Toggle Bug" Portable Drill Designed for Use in Steel Fabrication

INTERNALLY TRIPPED "LANDEX" DIE-HEAD

An internally tripped "Landex" die-head recently developed by the Landis Machine Co., Inc., Waynesboro, Pa., is applicable for close-to-shoulder threading



"Landex" Die-head which is Tripped Internally

on work of varying length on which a uniform length of thread is required. This die-head is particularly well adapted for threading operations where a fixed stop cannot be used to open the die-head or where the work is held loosely in a fixture, as on the table of a drilling machine.

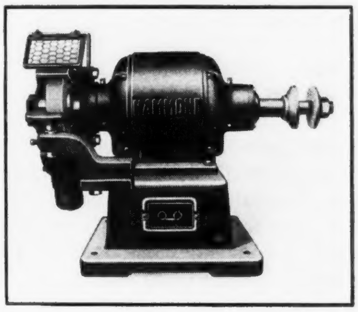
The tripping mechanism consists of a plunger held in the shank of the die-head, the shank being drilled and tapped to suit. The plunger is adjustable and can be set for any length of thread within the capacity of the die-head. When used on automatic screw machines, this die-head eliminates the necessity of timing the head-opening cam accurately, because the die-head is tripped positively when the end of the work comes into contact with the plunger. The die-head

is especially suitable for threading such parts as spark plug bodies, pipe plugs, pipe bushings, B-X connectors, bolts, screws, etc. It is made in different sizes for threading work from 3/16 inch to 2 inches in diameter.

HAMMOND COMBINATION GRINDER AND BUFFER

The Type LW combination grinder and buffer here illustrated is made in 1/2, 1 1/2, and 2 horsepower sizes by Hammond Machinery Builders, Inc., 1604 Douglas Ave., Kalamazoo, Mich. This equipment is intended for general-purpose service, as a grinding wheel can be mounted on one end, and a buffing, polishing, or wire scratch wheel on the opposite end.

The motor is especially designed for this service. The

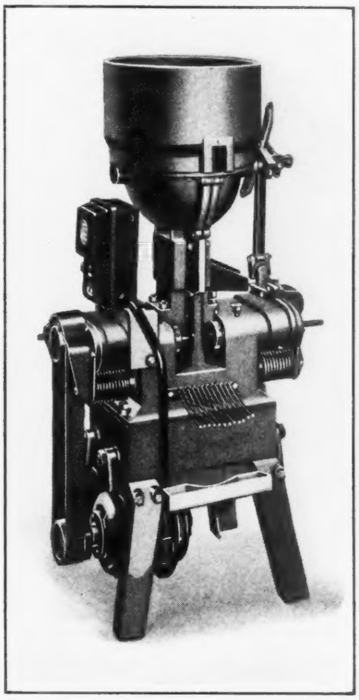


Hammond Grinder and Buffer Made in 1/2, 1 1/2 and 2 Horsepower Sizes

1 1/2- and 2-horsepower machines are equipped with a push-button control and a Cutler-Hammer automatic motor starter which protects the motor from overload, low voltage, and phase failure. The machine is furnished for alternating or direct current.

ARMSTRONG TUNGSTEN-CARBIDE TOOL-HOLDERS

A line of tool-holders especially intended for tungsten-carbide tools has been brought out by the Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago, Ill. These holders use high-speed steel bits tipped with less than an ounce of tungsten carbide. Because of the brittleness of this new cutting element, the holders



Kent Double Type of Nut Countersinkjng Machine

are built out under the bit to give maximum support to the cutting edge.

The holders are designed for use on lathes, planers, and shapers, and hold the bit parallel to the shank. They are of two general types, one type being broached for standard square bits and the other for deeper bits of sufficient thickness to compensate for the steel displaced by the tungsten-carbide tip.

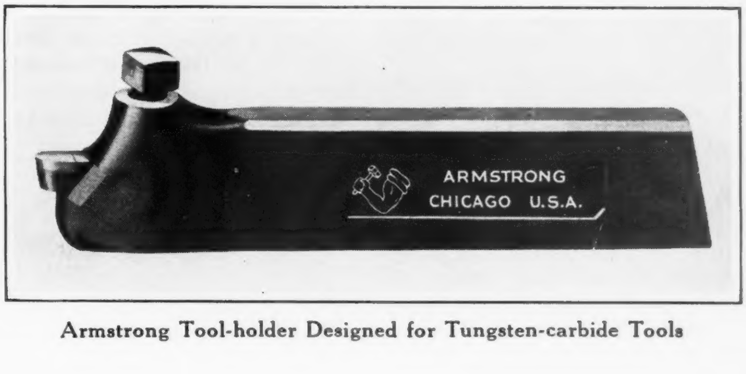
KENT NUT COUNTERSINKING MACHINE

A double type of machine for countersinking both ends of the hole in square or hexagon nuts has recently been placed on the market by the Kent Machine Co., Cuyahoga Falls, Ohio. The machine is fully automatic, nuts placed in the hopper being automatically delivered to feeding chutes from which they are fed into line with the countersinking spindles. Both ends of the hole are countersunk simultaneously to the same depth, after which the nut is automatically ejected from the machine and passed over a grid for the removal of chips.

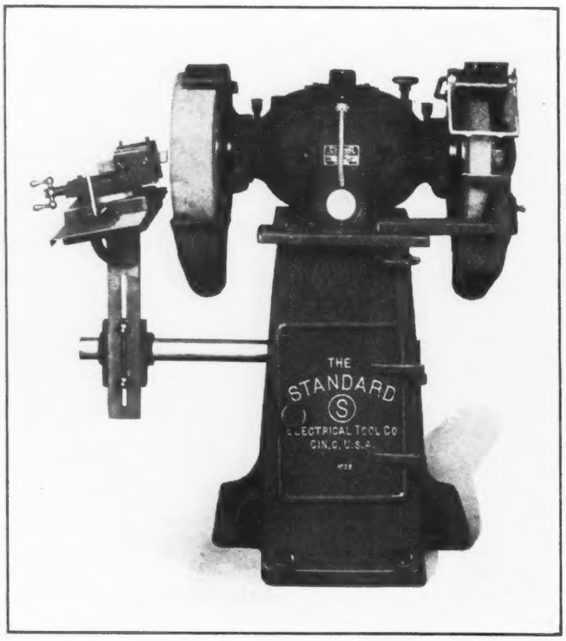
The hopper is of a double-feed design, being provided with chutes leading to a set of countersinking spindles on each side of the machine. It is adjustable for different sizes of nuts, and interchangeable feeding chutes are used to meet varied requirements in the diameter and thickness of the parts handled. The machine is built in two sizes, one of which is intended for countersinking standard nuts up to 1/2 inch and the other for nuts from 9/16 to 1 inch.

STANDARD ELECTRICAL TUNGSTEN-CARBIDE GRINDER

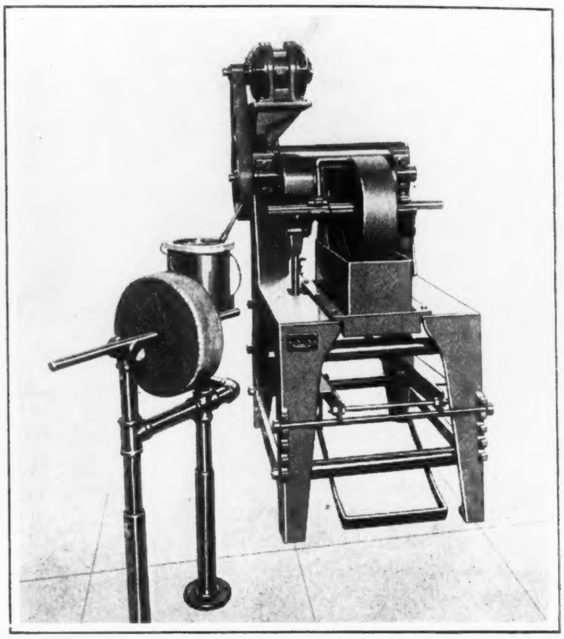
The direct motor-driven tool-bit grinder here illustrated has been developed especially for reconditioning the edges of tungsten-carbide tools by the Standard Electrical Tool Co., 1948 W. 8th St., Cincinnati, Ohio. One of the features of this equipment is a holder in which the tool is held rigidly by set-screws in a radial member. This member has a micrometer adjustment by means of a screw and ball crank. The radial member is also graduated at the base to insure precision in grinding to various



Armstrong Tool-holder Designed for Tungsten-carbide Tools



Grinder for Tungsten-carbide Tools, Developed by the Standard Electrical Tool Co.



Polishing-wheel Setting-up Machine Made by the General Spring Bumper Corporation

angles. Adjustments for rake are made by means of a 90-degree slot in the base of the attachment, which is also graduated.

Vertical adjustments are made by sliding the entire attachment in the long slot of the vertical member, while horizontal adjustments to compensate for wheel wear are made by sliding the knuckle joint along the bar. The top member, or tool-holder proper, is moved by hand across the face of the wheel, the travel being controlled by means of a slot in the base.

The machine is driven by a 3-horsepower motor equipped with a spindle that operates in S K F ball bearings. A coarse wheel for rough-grinding can be installed on one side of the machine, and a fine wheel for finish-grinding on the other side. The weight of the machine is approximately 810 pounds.

POLISHING-WHEEL SETTING-UP MACHINE

A polishing-wheel setting-up machine developed for use in the plants of the General Spring Bumper Corporation, 2660 E. Grand Blvd., Detroit, Mich., is being placed on the market by that concern. This equipment was designed with a view to reproducing the motions made by an expert in setting up polishing wheels. Abrasive is applied economically and uniformly on any sized wheel from 5 inches in diameter by 1 inch face width to 20 inches in diameter by 6 inches face width. Larger wheels can be covered if desired.

The construction of this machine is shown in the accompanying illustration. It is claimed that the use of this equipment not only reduces greatly the labor required for setting up wheels, but also increases the production possibilities of the wheels materially.

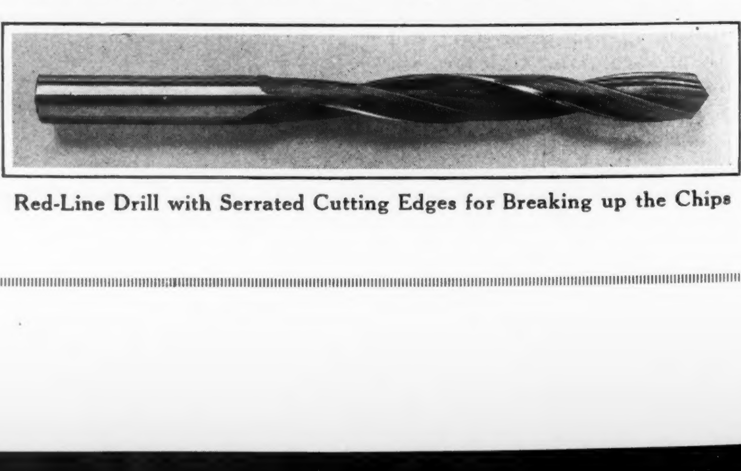
"RED-LINE" HIGH-SPEED CHIP-BREAKER DRILL

A line of high-speed steel drills having serrated cutting edges designed to break up the chips into fine pieces is being placed on the market by the Red-Line Reamer Co., Millersburg, Pa. It is claimed that drills of this design cannot clog and that, as a consequence, the breakage of drills is reduced to a minimum. Another advantage mentioned is that the chips are readily washed away from the work and consequently deeper cuts can be made before it is necessary to clean the drill.

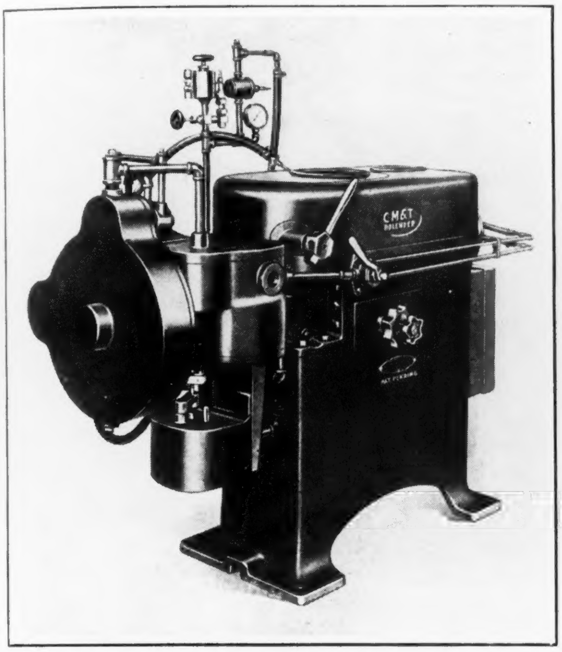
Two grooves in each flute form the serrated edges. These grooves are so located that the serrations of one flute do not follow the same path as those formed by the other set of grooves. All kinds of materials can be drilled with these tools. They are furnished with either straight or taper shanks.

BOLENDER GEAR-TOOTH BURNISHER

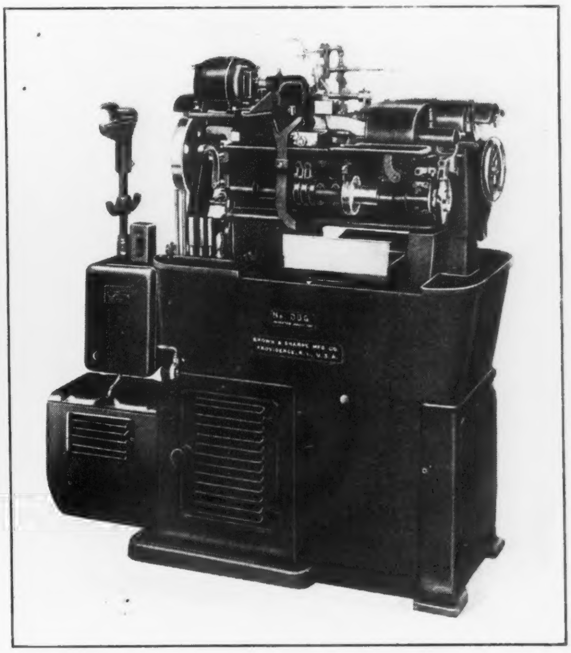
The accompanying illustration shows the Model 1 gear-tooth burnishing machine built by the City Machine & Tool Works,



Red-Line Drill with Serrated Cutting Edges for Breaking up the Chips



Bolender Model 1 Gear Burnishing Machine with Mechanical-electrical Control



Brown & Sharpe Automatic Screw Threading Machine of Improved Design

East Third and June Sts., Dayton, Ohio, equipped with the mechanical-electrical control described in an article published in May MACHINERY, page 727. In the previous article, the Models 0 and 2 burnishing machines made by the company were illustrated. The Model 1 machine is designed for use where the production does not require the large capacity or over-size construction of the Model 2 machine, which handles gears up to 14 inches outside diameter.

BROWN & SHARPE IMPROVED AUTOMATIC SCREW THREADING MACHINES

Two improved models — the Nos. 00 and 00G—have been added to the line of high-speed automatic screw threading machines manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I. These new machines are provided with a greater range of speeds than before and are adapted for manufacturing parts from steel as well as from brass, aluminum, and other freely cut metals. Both the work-spindle and the die-spindle have a range of twenty speeds, providing thirty different combinations of speeds to suit any material.

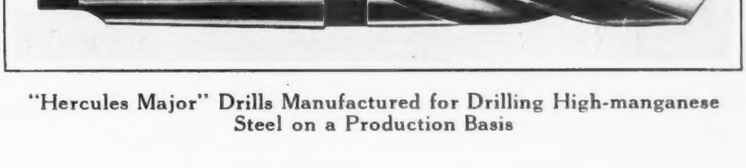
In general, all the important features of the previous designs have been retained. The work- and die-spindles run in the same direction, but at different speeds, the difference in the speeds permitting the die to run on at the required rate after it has been fed to the threading position. The tripping mechanism provides an accurate control for the length of stock threaded.

These machines can be provided with a vertical slide for cutting off, leaving the cross-slides free for forming and other operations. An automatic rod magazine of the design illustrated in June MACHINERY, page 780, may be employed. Certain classes of nuts and other tapped parts can be manufactured by mounting a tap in the die-spindle. Should one operation be required, the die-spindle can be arranged to hold a drill running at a maximum speed of 12,000 revolutions per minute.

The Brown & Sharpe Mfg. Co. also announces at this time that an automatic rod magazine has been developed for application to the No. 2 automatic screw machine. With this addition, all screw machines, except the Nos. 4 and 6 automatic, can be equipped with the automatic rod magazine.

"HERCULES MAJOR" DRILLS FOR HIGH-MANGANESE STEEL

Drills known by the trade name of "Hercules Major" have been developed by Whitman & Barnes, Inc., Detroit, Mich., for drilling high-manganese steel on a production basis. These new drills are made of a steel that is especially high in cobalt and tung-



"Hercules Major" Drills Manufactured for Drilling High-manganese Steel on a Production Basis

sten. The web is heavier and the twist much shorter than on regular taper-shank drills, which gives a rugged construction. The drills are pointed to an angle of 68 degrees, and the cutting lip has been blunted for strength. These drills were developed by the company's research department under the direction of Walter R. Breeler, metallurgical engineer.

CUTLER-HAMMER MOTOR STARTERS AND CONTACTORS

An alternating-current across-the-line automatic starter combined with a fusible disconnect switch in a single steel enclosing case has been developed by Cutler-Hammer, Inc., 1203 St. Paul Ave., Milwaukee, Wis. The advantages of this unit are compactness, simplified installation, and neat appearance. One of the features is a wiring channel between the starting panel and the back of the enclosing case, which allows of running the connecting wires behind the panel where they cannot interfere with the operation of the starter. All parts are mounted on a back-plate, which is easily removed for pulling and placing line and motor wiring. The disconnect switch is operated manually from outside the case. An interlock prevents opening the cover when the switch is closed and closing the switch when the cover is open, unless the interlock is released manually.

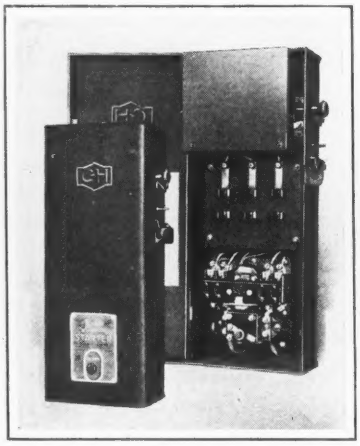


Fig. 1. Cutler-Hammer Motor Starter with Disconnect Switch

Fig. 2 shows a two-pole push-button-operated starting switch with thermal overload relays, which has been brought out by the same concern. It can be used with direct-current motors up to 1/2 horsepower, 115 volts, and 1/4 horsepower, 230 volts, or with alternating-current motors of single, two or three phase, up to 2 horsepower, 110 to 550 volts. The switch is small in size and can be mounted right on a machine. An open type of switch that can be built directly into machines is also available.

Two magnetic contactors rated for maximum capacities of 300 and 600 amperes are also being placed on the market by Cutler-Hammer, Inc., for heavy-duty alternating-current service. These contactors are arranged for either two- or three-wire control,

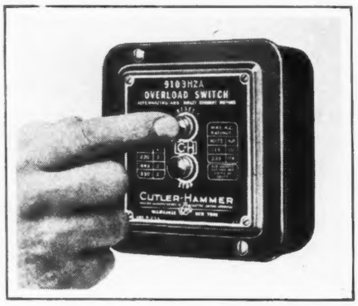
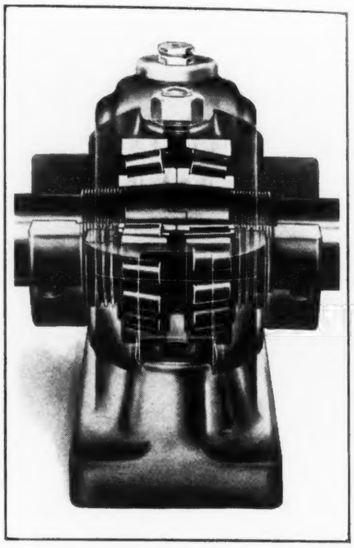


Fig. 2. Starting Switch for Small Alternating- or Direct-current Motors

have continuous-duty operating coils, and are equipped with unusually heavy butt-type solid-copper contacts. An air cushion absorbs the shock of the magnet in closing.

LINK-BELT PILLOW BLOCKS WITH TIMKEN BEARINGS

The Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., is introducing on the market a line of anti-friction ball and socket pillow blocks equipped with Timken tapered roller bearings as illustrated. These pillow blocks are manufactured to fit commercial shafting from 1 7/16 inches in diameter to the largest size, without the use of special fittings or appliances.

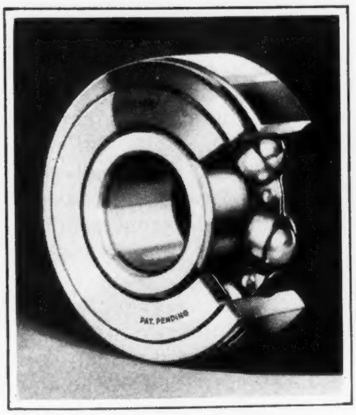


Link-Belt Pillow Block Equipped with Timken Bearings

The pillow blocks are arranged for pressure lubrication and are therefore practically dust-tight. Grease is forced into the bearing at the center and out at the shaft openings, so that with the addition of the grease seal at the top, dust and grit are kept out of the bearing.

NORMA-HOFFMANN "GREASEAL" BALL BEARINGS

A series of "Greaseal" annular ball bearings of the construction illustrated is being introduced to the trade by the Norma-Hoffmann Bearings Corporation, Stamford, Conn. These bearings have been developed with a view



Ball Bearing with New Type of Seal for the Lubricant

to reducing machining and mounting costs by eliminating a number of housing parts that would otherwise be necessary for mounting and protecting the bearings. Bearings of the new series are a combination of the standard annular closed type and a seal consisting of steel side plates with felt interposed, which closes one side of the bearing. An extension of the inner ring completes the seal.

The construction is particularly effective in retaining lubricant in the bearing, as well as preventing contamination of the lubricant by dirt from the outside. The all-steel construction, the load-carrying capacities, the standard width of the outer ring, and the added seal feature which provides a large internal grease capacity make this series of bearings suitable for both high and low speeds.

RUBBER-CUSHIONED BUFFING WHEELS

"Quick-As-Wink" rubber-cushioned buffing wheels are being placed on the market by C. B. Hunt & Son, Salem, Ohio, in 6-, 8-, and 12-inch diameters. These wheels are designed to give a smooth buffing action the full width of the wheel when used on either stationary or flexible shaft equipment.

Abrasive cloth from 24 to 180 grain can be used. New bands are applied easily without removing the wheel from the spindle. Strips of abrasive cloth can be attached with or without metal end clips. A slight turn of the wrench tightens the strip on the wheel, and when the wheel is revolved, a slight expansion of the rubber cushion occurs, so that the abrasive cloth hugs the entire surface tightly and does not slip at any speed or pressure. Each wheel is tested at speeds up to 8000 revolutions per minute, although the operating speeds recommended as most efficient by the manufacturer are from 3500 to 5000 revolutions per minute.

Applying Abrasive Cloth to Hunt Buffing Wheel

NATHAN MECHANICAL LUBRICATORS

Five different types of mechanical lubricators intended for lubricating all types of machinery are being introduced to the trade by the Nathan Mfg. Co., 250 Park Ave., New York City. Among the advantages claimed for these lubricators are easy and accurate regulation of the quantity of lubricant delivered; positive operation under all conditions; simple mechanical construction without any valves; uniform lubricant delivery at extremely slow speeds; and sufficient pressure for delivering the lubricant directly under the load.

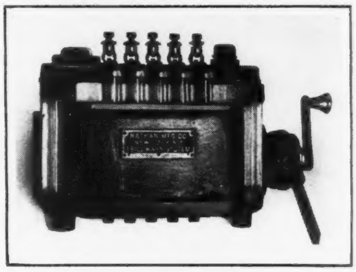


Fig. 1. Nathan Mechanical Lubricator with Piston for Each Feed

All the different lubricator styles are based on the same fundamental principle, there being a separate piston for each feed. A partial turn of any piston at the highest and lowest points opens ports which function as suction and delivery valves. A positive drive of either the ratchet or rotary type is provided. The lubricators are fitted with piston indicators which afford visual observation of the stroke, or with sight feeds.

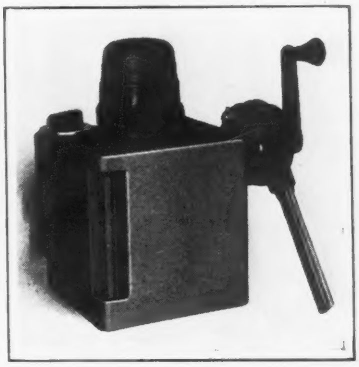
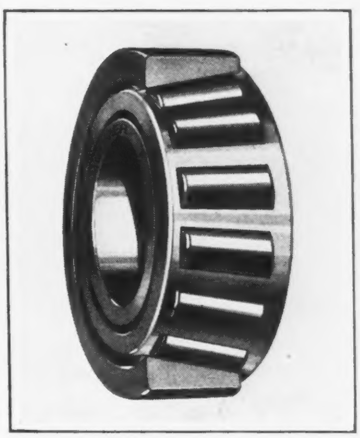


Fig. 2. Another Type of Nathan Mechanical Lubricator

Any number of feeds are provided to meet individual requirements, and each feed is adjustable separately. Every lubricator is guaranteed to work against a pressure of 500 pounds per square inch. Oil reservoirs are provided on the heavier types, while the lighter types are arranged for use with separate reservoirs or with reservoirs cast integral with the machine to be lubricated. Figs. 1 and 2 show two of the five styles.

HOOVER TAPERED ROLLER BEARINGS

Tapered roller bearings known by the trade name "True-Blue" are being placed on the market by the Hoover Steel Ball Co., Ann Arbor, Mich. These bearings are provided with rollers, the face



Hoover "True-Blue" Tapered Roller Bearing

of which is ground, lapped, and polished to a mirror finish. The large end of the rollers is also polished so as to carry the thrust loads with minimum loss of power due to friction. The retainer is given a special heat-treatment to provide strength and toughness and to provide a metal that will hold its shape and not injure the surface finish of the rollers.

GREENFIELD REAMERS AND SCREW PLATES

Recent additions to the line of small tools manufactured by the Greenfield Tap & Die Corporation, Greenfield, Mass., include an adjustable-blade reamer, a spiral expansion reamer with pilot bushing, a spiral expansion piston-pin reamer, a quick-spiral taper-pin reamer, and screw plates.

The adjustable-blade reamer is of the Critchley type and is furnished with unusually heavy blades. This reamer, which is illustrated at *A*, Fig. 1, can be adjusted over a wide range, and a particular feature is the use of floating rings between the blades and the adjusting nuts. These rings, which have angular seats and are flexible, permit each blade to be tightened separately and prevent springing of the reamer body. The adjustable-blade reamer is designed for general use, and replacement parts are available.

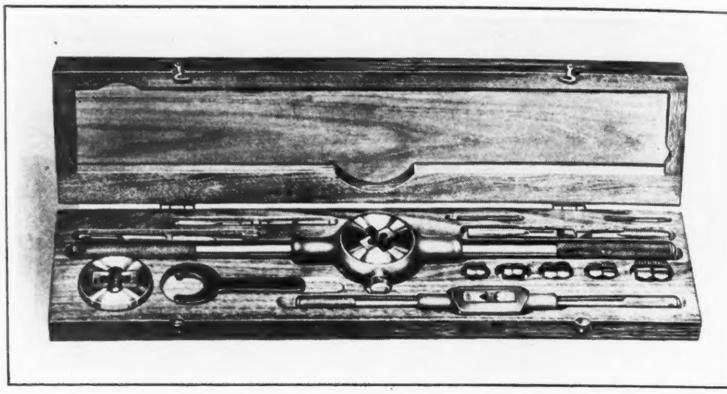


Fig. 2. "Pericles" Screw Plate Set of Simplified Design

At *B* is shown the spiral expansion reamer with pilot bushing, which is designed for finishing holes in accurate alignment. The slip or floating pilot used is tapered on the outside to insure a snug fit in the hole. This pilot will fit any size of hole within the capacity of the reamer. The slip pilot is supplied regularly, but the reamer can also be obtained with an adjustable pilot of the type specified for aircraft work. The adjustable pilot has four blades sliding on tapered seats, which are expanded uniformly by nuts at each end of the bushing.

The spiral expansion piston-pin reamer shown at *C* may also be used for work other than pistons. The long pilot is provided with "end cut," which enables the tool to be started through bushings that have been damaged. The pilot and shank support the reamer during the entire time that the blades are cutting. The high-speed steel quick-spiral taper-pin reamer shown at *D* is designed for reaming taper-pin holes by power, and can be run at drilling speeds in portable electric drills, etc.

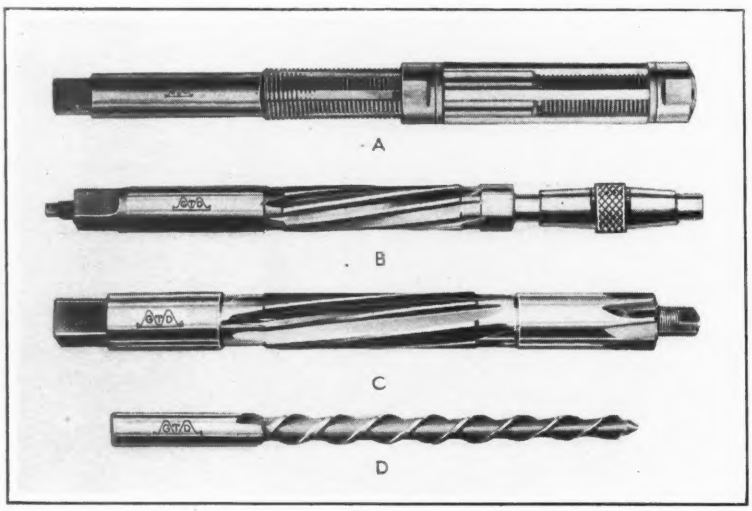


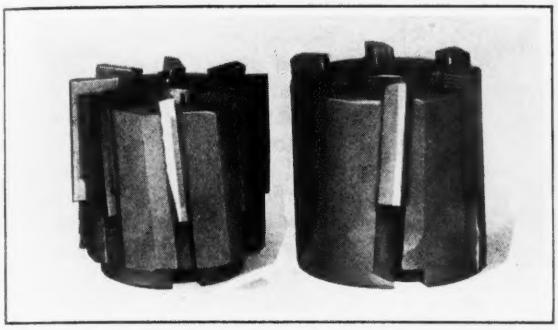
Fig. 1. Four Styles of Reamers Recently Brought out by the Greenfield Tap & Die Corporation

Fig. 2 shows a "Pericles" screw plate set in which the method of holding the dies has been simplified by the use of a new adjustable guide stop which eliminates numerous parts. These screw plates employ "Little Giant" dies.

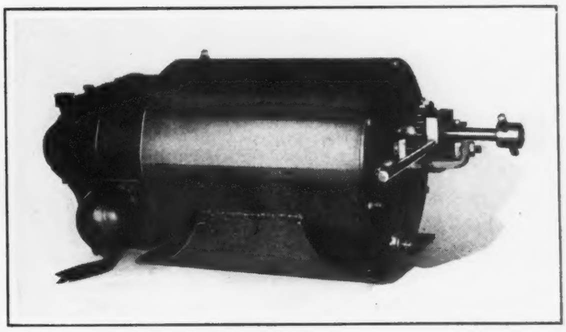
GODDARD & GODDARD SERRATED-BLADE EXPANSION REAMERS

Expansion reamers provided with serrated cutter blades that can be adjusted quickly and positively are being placed on the market in a large range of sizes by the Goddard & Goddard Co., Inc., Detroit, Mich. Both roughing and finishing styles are manufactured. In the illustration, a finishing reamer is shown at the left and a roughing reamer at the right.

In adjusting the blades of a roughing reamer, the blade wedges are first knocked out. The blades are next moved forward a distance of one serration, and the wedges reset. The cutting edges can then be resharpened. With finishing reamers, the wedges are merely loosened and the blades tapped back until the diameter of the reamer has been increased about 0.003 inch. The wedges are then reset and



Goddard & Goddard Finishing and Roughing Reamers with Serrated Blades



Westinghouse Combined Motor and Three-speed Reduction Unit

the cutting edges resharpened. After the blades have been moved back about flush with the end of the reamer through successive resharpenings, the wedges are knocked out and the blades are set ahead 3/16 inch and radially outward a distance of one serration. The wedges are then reset and the reamer sharpened.

Milling cutters of various styles equipped with serrated cutter blades were described in an article published in October, 1929, MACHINERY, page 120-B.

LANGELIER AUTOMATIC SWAGING MACHINE

A swaging machine recently built by the Langelier Mfg. Co., Providence, R. I., for automatically swaging temple butts used in the manufacture of eyeglasses is shown in the accompanying illustration. These temple butts vary in length from 2 to 3 inches. The butt ends are 0.080 inch in diameter and the swaged section is 0.050 inch in diameter. The machine takes the wire from coil, straightens, swages, and cuts it off to the proper length. Eight temple butts are produced per minute.

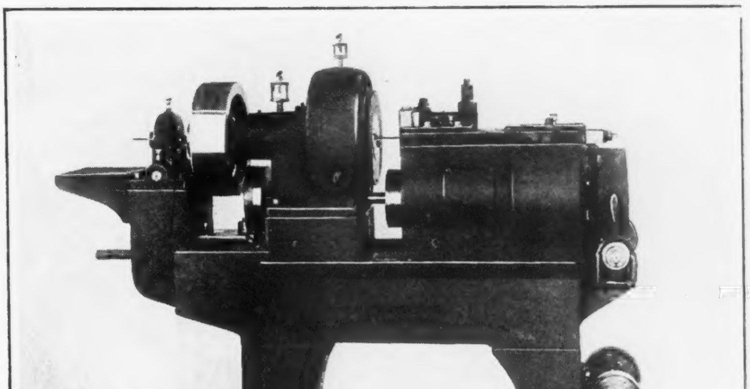
The machine consists of a standard No. 3 open-die swaging head mounted on a horizontal bed, the head being driven by belt from a motor under the machine. The mechanism for drawing the wire through the swaging dies and for cutting it off to uniform length is mounted on the other end of the bed. There is a shaft on which four cams are mounted. One of these cams, located directly under the swaging head, operates the wedge draw-spindle in the head. A drum cam on the opposite end of the shaft operates a draw-bar which has a pair of gripping jaws that pull the wire through the dies. These gripping jaws are opened and closed by a cam. The cut-off and wire-holding device is adjustable to suit different lengths of temple butts. It is also cam-controlled.

The camshaft is operated at two speeds, the wire draw-bar being actuated at a slow feed while the wire is being swaged and at a fast feed for the remainder of the cycle. A hand-operated clutch is provided, so that the camshaft can be started or stopped at any time. The machine occupies a floor space of 26 by 70 inches and weighs approximately 2000 pounds.

WESTINGHOUSE CARRIAGE DRIVING UNIT

A combined motor and three-speed reduction unit has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to drive work-holding devices for automatic welding. This service requires high gear reductions with wide speed ranges, compactness, and provision for engaging and disengaging the drive while the motor is running. The gear ratios of this equipment with the three gears are 534 to 1, 1295 to 1, and 3060 to 1. With a field control on the motor, an uninterrupted speed selection between 0.393 and 6.67 revolutions per minute was obtainable at the final shaft of a recently tested unit.

All gears are of the spur type

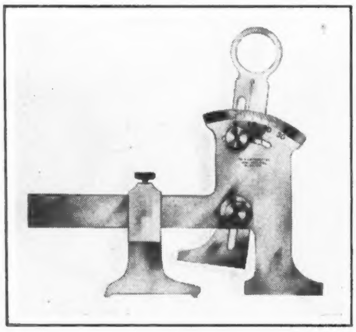


Langelier Automatic Swaging Machine for Temple Butts

and anti-friction bearings are provided. The unit has been applied to a 1/3-horsepower direct-current motor, the mechanical parts being housed in a cylindrical frame bolted to the motor frame.

TRENT ELECTRIC FURNACES

Electric furnaces that seal themselves with one-piece locking devices have been brought out by the Harold E. Trent Co., 439-43 N. 12th St., Philadelphia, Pa. One of these furnaces is shown in the accompanying illustration. When the counterweight rod is released, the door settles easily into place by gravity. Fastened to the front of the furnace by loose-fitting bolts that permit a rocker action, there are one-piece locking members, one on each side. Wedge-shaped projections on the door casting engage the bottom of the locking members, and in so doing jam the upper ends of the latter against the top corners of the door. This results in a tight joint between the door and furnace front, and retains the heat within the furnace. Another feature of the furnaces is the use of a continuously folded and formed ribbon heating element which has no sharp corners.



Starrett Gage for Determining Clearance of Milling Cutters

STARRETT CUTTER-CLEARANCE GAGE

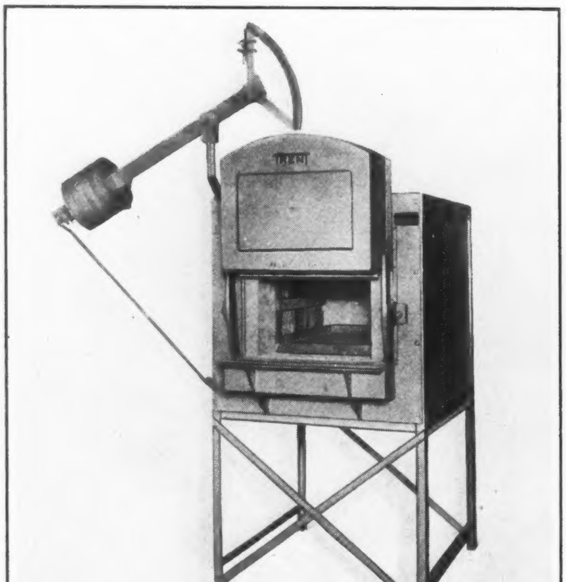
A gage designed for determining the clearance on all types of milling cutters from 1/2 to 30 or more inches in diameter has been developed by the L. S. Starrett Co., Athol, Mass. This gage gives precise readings, in degrees, on cutters ranging from 2 to 30 inches or more in diameter.

As shown in the illustration, the gage consists of a tool-steel beam fitted with one stationary foot having its contact edge parallel with the beam. There is also a sliding foot which has an edge that is parallel with the beam, and an upright blade which is adjustable both perpendicularly and at an angle. The instrument is graduated from 0 to 30 degrees.

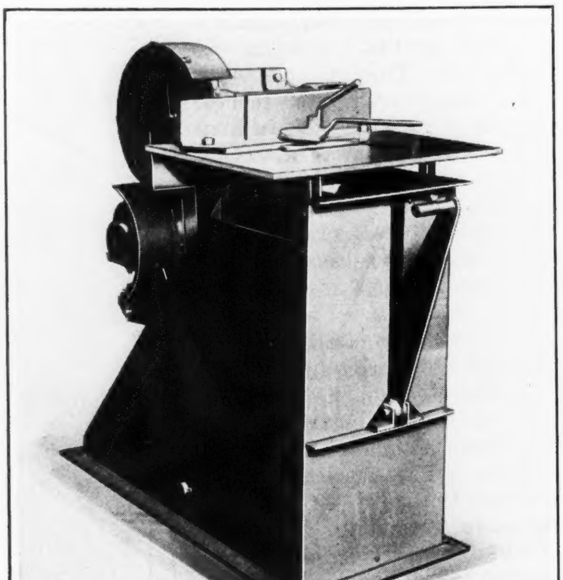
Three simple adjustments are required for taking readings. Measuring side clearance on large-diameter, coarse-pitch cutters is a simple matter, because the contact edge of the sliding foot is in line with the edge of the stationary foot. Perpendicular and angular adjustments of the upright blade are independent of each other, thus allowing precise measurements to be made. An important advantage of the gage is that it can be applied without removing the cutter from its arbor on the grinding or milling machine.

RYERSON HIGH-SPEED CUT-OFF SAW

A high-speed metal-cutting saw recently added to the line manufactured by Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts., Chicago, Ill., is the smallest of the line. It is intended for cutting light-gage steel molding and small shapes of non-ferrous metals. Solid steel sections from 1/4 to 3/8 inch round or square can be cut with the regular toothed blade, and sections slightly larger with the abrasive disk. Aluminum or brass sections that fit into the work-table can be quickly cut.



Trent Electric Furnace which Seals Itself

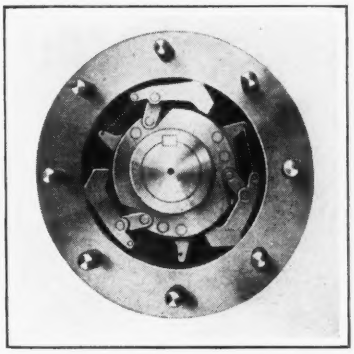


Ryerson Cut-off Saw for Light-gage Metals

No water or other coolant is required in the cutting-off operations. The entire unit is built into a frame made of welded structural steel. The blade is mounted on an arbor carried by two double-row self-aligning ball bearings. The arbor is driven by a 3/4-horsepower motor through triple V-belts. The table is adjustable up and down to obtain the most efficient cutting conditions. There is a quick-operating clamp for holding shapes while cutting them. The entire clamp may be set at any angle up to 45 degrees for cutting to miters.

PITTER ONE-WAY CLUTCHES

One-way clutches designed to replace ratchets and similar devices have been developed by the Universal Gear Corporation, 327 S. La Salle St., Chicago, Ill. As illustrated, these clutches consist of a central spindle carrying three pivoted arms which have shoes at the outer ends fitting in an annular groove. Light coil springs keep these shoes in position for gripping, but the springs take no part in the drive. When an effort is made to rotate the spindle in the driving direction, the shoes lock instantly against the inner and outer sides of the groove, thus giving an instantaneous positive lock at two points on each of the three shoes without any lost movement. It is claimed that, with these clutches, there is no tendency to jam or any possibility of slipping. They are made in eleven standard sizes for shafts from 1/4 to 6 inches in diameter.



Pitter One-way Clutch which Engages and Releases Instantly

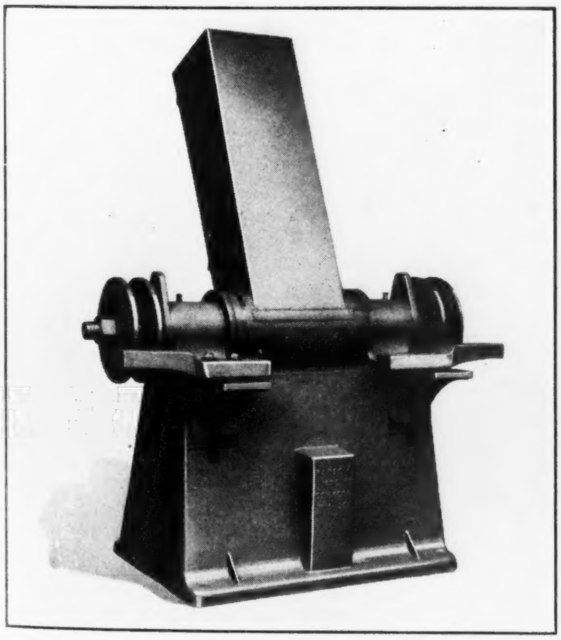
RANSOM GRINDING MACHINE BELT GUARD

Special grinding machines of the snagging type, which were recently built by the Ransom Grinding Machine Co., Oshkosh, Wis., for a large agricultural implement manufacturer, were equipped with a belt guard of the design illustrated. Each of the machines is driven by a belt from an overhead countershaft. The guard protects the belt to a height of 7 feet above the floor. It is made of No. 14 sheet iron.

The principal feature of the guard is that it can be tilted to any angle necessary to suit the positions of the countershaft and the grinder. There is a large hinged door in the back of the guard which gives ready access to the belt for repairs. In the illustration, the machine is shown without the grinding wheels or wheel guards.

LAPPING MACHINES FOR TUNGSTEN-CARBIDE TOOLS

Two machines equipped with iron lapping wheels charged with diamond dust are being placed on the market by the Modern Diamond Tool Co., 1050 Mt. Elliott Ave., Detroit, Mich., for lapping tungsten-carbide tools. The wheels used on these machines are of a composite construction for which the advantage of a fast cutting action is claimed. In lapping, the wheel



Special Ransom Grinding Machine with Unusual Belt Guard

Fig. 1. Diamond Lapping Machine for Tungsten-carbide Tools

is kept slightly moist with a mixture of olive oil and diamond powder so that a keen edge will be produced on the tools quickly.

The machine shown in Fig. 1 is of a vertical design with the lapping wheel revolving in a horizontal plane. It is driven by a 1/2-horsepower motor. The lapping wheel is 11 inches in diameter and runs at a speed of 1725 revolutions per minute. The table measures 36 by 24 inches.

Fig. 2 shows a machine in which the lapping wheel runs in a vertical plane and is driven by a 1/2-horsepower motor at a

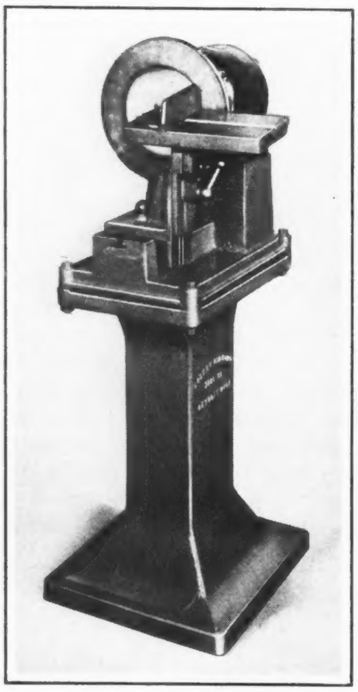
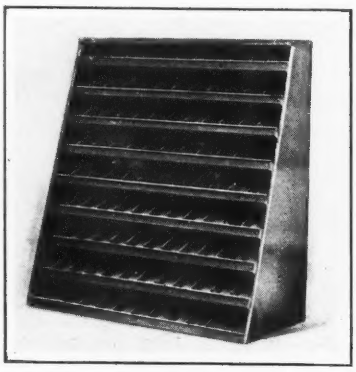


Fig. 2. Another Machine with Diamond-charged Lapping Wheel

speed of 1725 revolutions per minute. This machine is provided with a table that can be adjusted horizontally, vertically, and to different angles. An angle gage, graduated in degrees, is also provided. The table measures 6 1/2 by 11 inches.

DRILL AND REAMER BIN

A drill and reamer bin designed to fit into shelving is manufactured by the Angle Steel Stool Co., Plainwell, Mich. This bin is intended for holding drills and reamers of all sizes in sep-



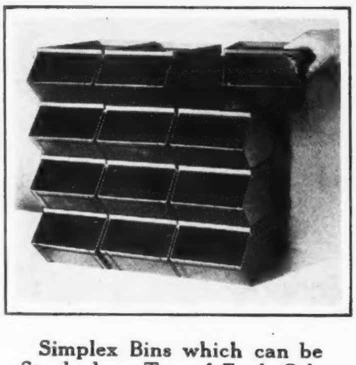
Drill and Reamer Bin Made by the Angle Steel Stool Co.

arate compartments. The bin is constructed of No. 20 gage material, and has nine shelves with twelve compartments per shelf. Label holders for identifying the contents of the various compartments run the full length of each shelf.

The compartments are 3 inches wide by 3 1/2 inches high, and their length varies according to the location of the shelves, the bin being 6 1/2 inches deep at the top and 18 inches at the bottom. The bin itself is 38 inches high by 35 1/2 inches long.

SIMPLEX NESTING BINS

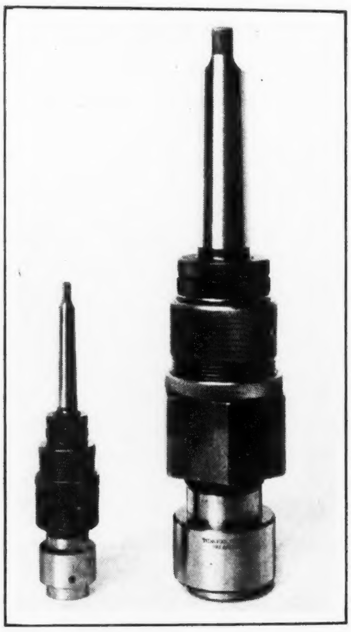
Bins that can be used advantageously on a bench for holding parts being assembled, in a toolcrib for holding bolts and nuts, or in a stock-room for storing parts to be used in different manufacturing operations are being introduced on the market by the Simplex Tool Co., Woonsocket, R. I. These bins nest in one another as illustrated, and thus a large number of parts can be reached more easily by the



Simplex Bins which can be Stacked on Top of Each Other

assembler than if they were placed in pans spread out along a bench.

The stacking of bins on top of each other conserves space, keeps more work ahead of a machine operator when a conveyor system is used, and saves time in handling work by trucks. The contents of the bins are always visible, and empty bins can be readily picked out. The bins are made in three sizes, as follows: 4 by 5 1/2 by 10 inches; 5 1/4 by 7 1/2 by 12 1/2 inches; and 6 1/2 by 9 by 15 inches. They may be furnished either with or without card holders.

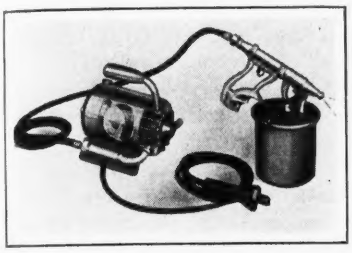


Two New Sizes of Titan "Safety Drive" Chucks

TITAN "SAFETY DRIVE" CHUCKS

Recent additions to the line of "Safety Drive" chucks made by the Titan Tool Co., Erie, Pa., include a size for taps as small as 3/16 inch, and a large size for taps up to 1 1/4 inches, inclusive. Larger chucks can be made to meet individual requirements.

These new sizes embody the Titan differential nut principle for tension adjustment. This feature enables the user to increase or decrease the driving tension quickly to any point desired within the capacity of the tool. The adjustment is accom-



Paasche Air-painting Unit
Driven by Universal Motor

plished by means of a differential nut which joins the tension members by right-hand threads of different pitches. The device may be adjusted on the machine without disturbing the set-up.

Round knurled adjustment nuts are provided on the small size, and hexagon nuts on the large size for tightening by the application of a wrench. The tension members consist of male and female steel cones, separated by a cone made of sheet fiber. These chucks are suitable for drilling, tapping, and stud driving. Collets with an open end for the protruding tang facilitate changing the drill without the use of additional tools. Full-floating tap collets which compensate for lateral movement in high-speed and multiple-head tapping, and quick-release tap collets with a ball retaining feature, can be used. An adaptation of the Titan automatic non-reverse stud-setter can be used for driving studs which bottom in tapped holes.

PAASCHE AIR PAINTING UNIT

The latest addition to the line of air painting equipment made by the Paasche Airbrush Co., 1909-1923 Diversey Parkway, Chicago, Ill., is shown in the illustration. This outfit is provided with a patented round or fan-shaped sprayer which is controlled by means of a pistol grip and trigger. It will give a narrow or a wide fan spray with a low air pressure. The control sleeve can be set to give any speed and size of spray best suited for the work. The air compressor is driven by a universal motor, and is equipped with a silencer and an air-cooled handle.

RICKERT-SHAFER DIE-HEADS

A Model C die-head of the construction illustrated in Fig. 1 has been developed by the Rickert-Shafer Co., Erie, Pa., for close-to-shoulder threading. This development retains all the features of the regular Model C die-head which was described in June MACHINERY, page 830. Die-heads of this model are of a self-opening automatic design, and have been brought out primarily for use on automatic screw machines and chucking machines.

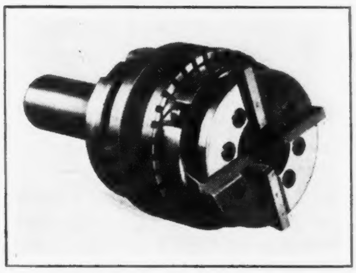


Fig. 1. Rickert-Shafer Die-head Designed for Close-to-shoulder Threading

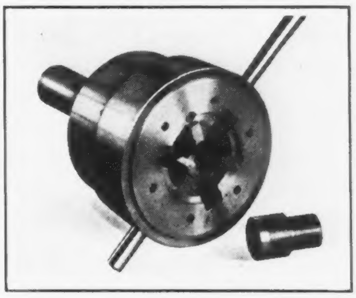


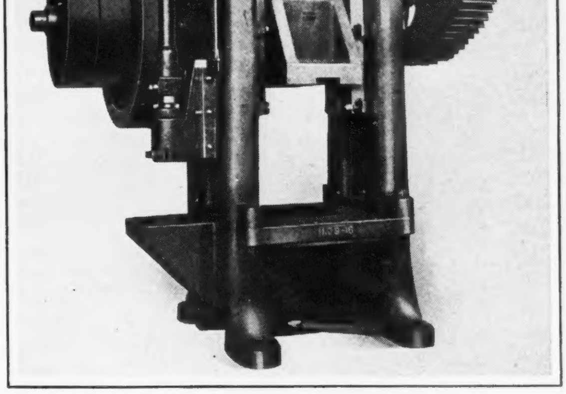
Fig. 2. Special Die-head which Cuts Threads on Two Surfaces Simultaneously

Fig. 2 shows a special die-head designed to cut threads simultaneously on two surfaces of different diameters. The operation is performed on the end of a crankshaft. Obviously, the threading time in this operation is cut in half by the use of the combination tool.

ZEH & HAHNEMANN STRAIGHT-SIDED PRESS

A straight-sided power press constructed to exert a normal pressure of 250 tons has been added to the line built by the Zeh & Hahnemann Co., 182-200 Vanderpool St., Newark, N. J. In tests, this machine has exerted a pressure of 375 tons. When driven by single back-gearing as shown, the machine weighs 37,000 pounds and operates at thirty strokes per minute. The standard stroke is 6 inches, and the distance between the uprights, 30 inches. The back-gear shaft runs in roller bearings.

One of the features of construction is the location of the large driving gear, which is placed so close to the frame that an outboard bearing is not required. This design, in turn, gives free access to the jaw clutch. The clutch can be inspected or dismantled

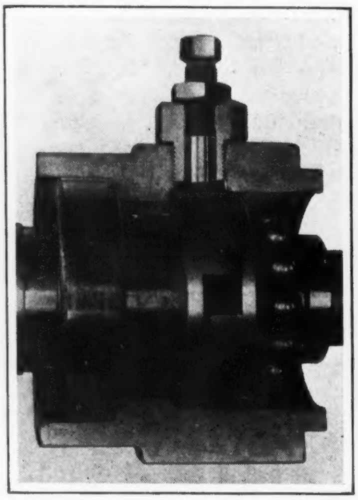


Zeh & Hahnemann Straight-sided Press
Rated at 250 Tons Capacity

without interfering with any other parts. The equipment includes a side shear attachment and a central lubrication system.

"TACUP" BALL- OR ROLLER-BEARING ADJUSTMENT

Cam-rings for taking up the play of either ball or tapered roller bearings as they become worn are manufactured by the L. Holland-Letz Co., Crown Point, Ind., in a complete range of sizes for bearings from 1.1811 to 10.4331 inches in diameter. These cam-rings constitute the principal members of a "Tacup" adjustment, and are assembled with a bearing as illustrated.



"Tacup" Adjustment in Ball Bearing Installation

The rings are so constructed that they are rotated in opposite directions by a radially adjusted wedge member operating through an opening in the bearing sleeve. This shifts the outer bearing member axially until any desired pressure has been obtained. The wedge member is manipulated by a screw and held in position by a lock-nut.

The cam-rings are made of hardened steel and are ground to a slightly freer fit on the bearing sleeve than the bearing. They can be used on the spindles of lathes, milling machines, heavy-duty grinding machines, snagging grinders, etc.; on the worm-shafts of speed reducers; and on other machine members.

PERSONALS

R. Rude has been appointed office manager of the Baltimore office of the Lincoln Electric Co., Cleveland, Ohio, and C. N. Hilbinger has been appointed sales engineer and service manager.

Francis A. Emmons, sales manager of Foote Bros. Gear & Machine Co., 111 N. Canal St., Chicago, Ill., has been elected vice-president in charge of sales and advertising of the Gear Division Sales.

H. R. Rowland, formerly Pittsburgh district sales manager of the A. M. Byers Co., manufacturer of wrought-iron pipe, has been assigned to the post of division manager with headquarters in Philadelphia, Pa.

W. O. Conway, formerly director of education for the American Arbitration Association, has joined the headquarters staff of the National Electrical Manufacturers' Association, 420 Lexington Ave., New York City.

N. B. Chace, Jr., formerly with the Peninsular Machinery Co., of Detroit, Mich., has been appointed vice-president and general sales manager of the Fosdick Machine Tool Co., Cincinnati, Ohio, manufacturer of drilling machines.

H. W. Rinearson, formerly vice-president and general manager of the Armco Culvert Manufacturers' Association, has been appointed vice-president in charge of sales of the A. M. Byers Co., Pittsburgh, Pa.

John G. Benedict, treasurer and general manager of the Landis Machine Co., Waynesboro, Pa., has been elected a trustee of the Pennsylvania State College, State College, Pa. Mr. Benedict is also president of the National Metal Trades Association.

W. L. Batt, president of the S K F Industries, Inc., New York City, has been nominated a member of the Council of the American Society of Mechanical Engineers to serve for a period of three years, beginning with the annual meeting in December, 1930.

W. L. Lewis, formerly assistant comptroller of the Bethlehem Steel Corporation, at a recent meeting of the board of directors, was elected vice-president, secretary, and treasurer of the Chicago Pneumatic Tool Co., 6 E. 44th St., New York City, succeeding J. G. Grimshaw.

Frank Seese, secretary-treasurer of the Marshall & Huschart Machinery Co., Chicago, Ill., completed twenty-five years of service with the company on June 5. The event was fittingly observed by his associates, who presented him with a desk set and a fountain pen set.

L. W. Chubb, formerly manager of the radio engineering department of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and more recently assistant to the vice-president of the Radio Victor Co., has returned to the Westinghouse organization as director of the research laboratories.

H. E. Johnson, for the last seven years sales manager of the Strom Steel Ball Co., Chicago, Ill., has become associated with the sales organization of the Hoover Steel Ball Co., Ann Arbor, Mich. Mr. Johnson has been connected with the ball and bearing industry for the last twelve years.

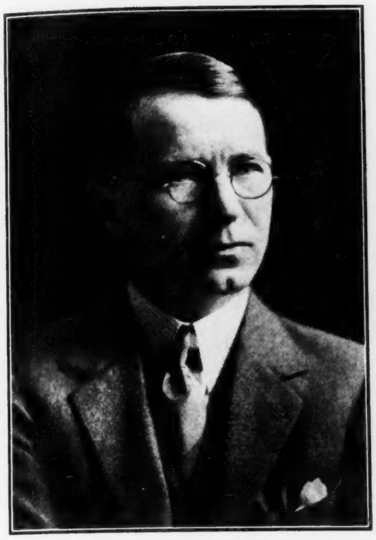
Horace Armstrong, secretary and sales manager of Armstrong Bros. Tool Co., 313 N. Francisco Ave., Chicago, Ill., manufacturer of tool-holders and pipe tools, has left on an extended business trip to Europe, during which he will visit twelve European countries, calling on Armstrong representatives.

Hayden B. Russell has been appointed sales representative of the Modern Tool Works Division of Consolidated Machine Tool Corporation of America, Rochester, N. Y., in the metropolitan district, with headquarters at 150 Broadway, New York City. Mr. Russell was formerly associated with the Carboloy Co. and the Speakman Co. in a similar capacity.

Thompson A. Lyon, for the last ten years superintendent of the Davis & Hemphill Co., Elkridge, Md., manufacturer of screw machine products, has recently been appointed plant superintendent of the Alexander Milburn Co., Baltimore, Md., manufacturer of oxy-acetylene apparatus, portable carbide lights, and paint and lacquer spray equipment.

Guiseppe Faccioli, electrical engineer with the General Electric Co., Schenectady, N. Y., has retired from active participation in the affairs of the company because of ill health. Mr. Faccioli has relinquished his duties as Pittsfield works engineer and associate manager of the Pittsfield Works of the company and assumed the position of consulting engineer. He has been associated with the company for more than twenty years.

Harold S. Falk, vice-president and works manager of the Falk Corporation, Milwaukee, Wis., has had the honorary degree of Master of Science conferred on him by Marquette University, in recognition of the work done by him in the promotion of apprentice training in American industries. As is well known to the readers of Machinery, Mr. Falk has played a leading part in the establishment of modern apprentice training methods in the last ten years, during which time he has been chairman of the Apprentice Committee of the Milwaukee Branch of the National Metal Trades Association. Under his direction, the number of apprentices in the machinery-



Harold S. Falk

Warner Seely

© Bachrach

Heyman Rosenberg

building industries in Milwaukee has grown from about 400 in 1920 to 1100 at the present time. Mr. Falk is also a member of the Advisory Committee on Apprenticeship to the Industrial Commission of Wisconsin, a member of the Committee on Education and Training of the American Society of Mechanical Engineers, and chairman of the Committee on Education of the National Metal Trades Association.

WARNER SEELY, secretary of the Warner & Swasey Co., Cleveland, Ohio, was unanimously elected president of the Cleveland Engineering Society at the annual meeting of the executive board. Mr. Seely was formerly vice-president of the Society.

L. M. JOHNSTON has resigned as vice-president of the A. M. Byers Co., Pittsburgh, Pa., manufacturer of wrought-iron pipe.

HEYMAN ROSENBERG, vice-president of the Parker-Kalon Corporation, New York, was recently awarded the Certificate of Merit of the Franklin Institute for his development of Parker-Kalon hardened self-tapping screws.

ROY V. WRIGHT, managing editor of the *Railway Age*, New York City, has been nominated for president of the American Society of Mechanical Engineers to serve during the year 1931.

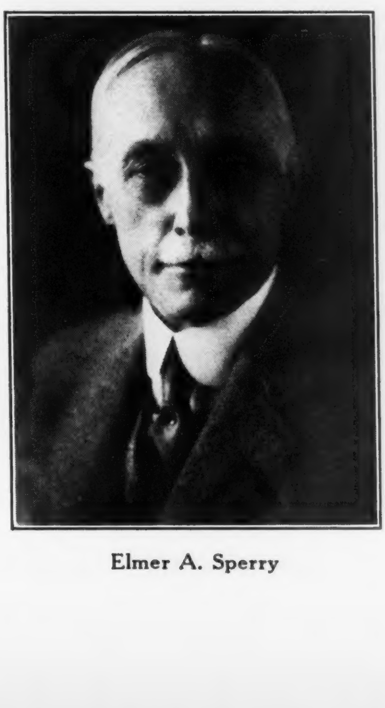
OBITUARIES

ELMER A. SPERRY

Elmer Ambrose Sperry, up to a year ago chairman of the board of the Sperry Gyroscope Co., Brooklyn, N. Y., and past president of the American Society of Mechanical Engineers, a world-famous engineer, inventor, and manufacturer, died at St. Johns Hospital, Brooklyn, Monday, June 16, aged seventy years. For over fifty years Mr. Sperry was an unusually active and successful worker in a surprisingly wide field of engineering and applied science. He obtained over 400 patents on inventions in the mechanical, electrical, and electrochemical industries. He is, perhaps, best known for the development of the gyroscopic compass and the gyroscopic stabilizer for ships and airplanes, but these were but two of his many achievements.

Mr. Sperry was born in Cortland, N.Y., in 1860. He spent a year at Cornell University, but most of his engineering training was obtained through his own efforts later. In 1879, when not yet twenty years old, he perfected one of the first electric arc lights. At the age of twenty, he founded the Sperry Electric Co. of Chicago for manufacturing arc lamps, dynamos, motors, and other electrical appliances. He was the first engineer to build electrical mining machinery, which he undertook in 1888. About 1896 he turned his attention to making practical use of the principles underlying the toy known as the gyroscopic top, and he skillfully combined electrical and mechanical elements into successful gyroscopic compasses and gyroscopic stabilizers for ships and airplanes.

All these activities in the fields of invention, engineering, and manufacturing did not prevent Mr. Sperry from taking an active part in the work of professional engineering societies. He was a founder member of the American Institute of Electrical Engineers, and a member of the Society of Naval Architects and Marine Engineers, the Society of Automotive Engineers, the American Petroleum Institute, the National Aeronautical Association, Franklin Institute, and American Society of Mechanical Engineers, of which he was president in 1929.



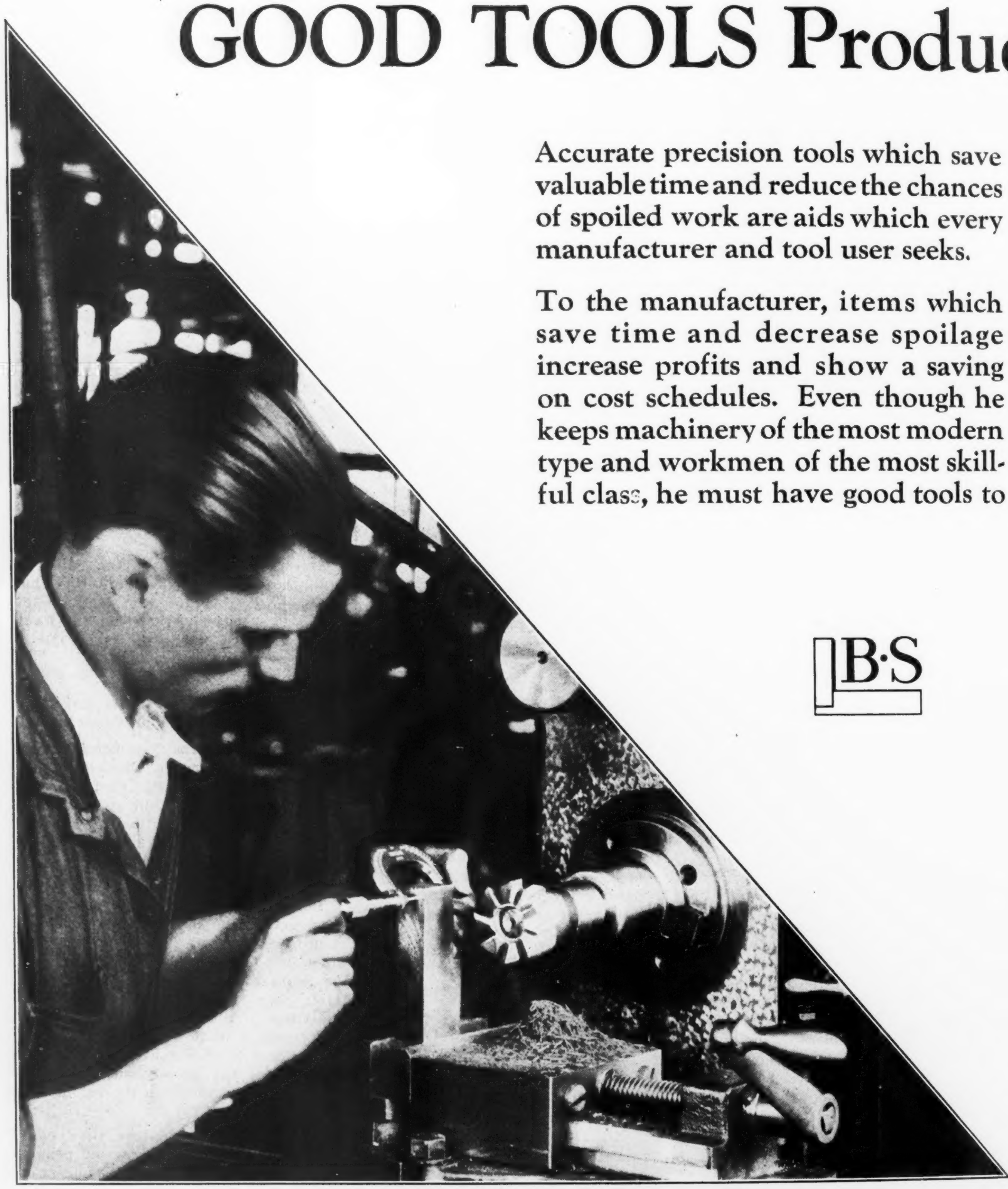
Elmer A. Sperry

ARTHUR J. SELZER, commercial agent for the Westinghouse Electric Supply Co., East Pittsburgh, Pa., died suddenly at Hot Springs, Va., while attending the convention of the National Electrical Manufacturers' Association. Mr. Selzer had been commercial agent for the company during the last four years.

COKER F. CLARKSON, secretary and manager of the Society of Automotive Engineers for the last twenty years, died June 4 of heart disease at his home at Scarborough-on-Hudson, N. Y., aged sixty years. Mr. Clarkson guided the activities of the Society of Automotive Engineers in a most successful manner, and it was largely due to his untiring efforts that the Society has become a most important factor in the automotive industry.

WILLIAM J. DELLES, executive engineer of the turbine engineering department of the General Electric Co., Schenectady, N. Y., died at his home in Schenectady on May 22, following a sudden attack of heart disease. He was to have sailed the following week as a delegate to the World Power Conference in Berlin. Mr. Delles was born in Rochester, N. Y., and graduated from the Mechanics Institute of that city. He entered the employ of the General Electric Co. in the drafting department in 1898. Later he was made assistant to the manager of the Schenectady Works, and in 1919, was transferred to the turbine department.

GOOD TOOLS Produce B



Accurate precision tools which save valuable time and reduce the chances of spoiled work are aids which every manufacturer and tool user seeks.

To the manufacturer, items which save time and decrease spoilage increase profits and show a saving on cost schedules. Even though he keeps machinery of the most modern type and workmen of the most skillful class, he must have good tools to

B·S

Brown &

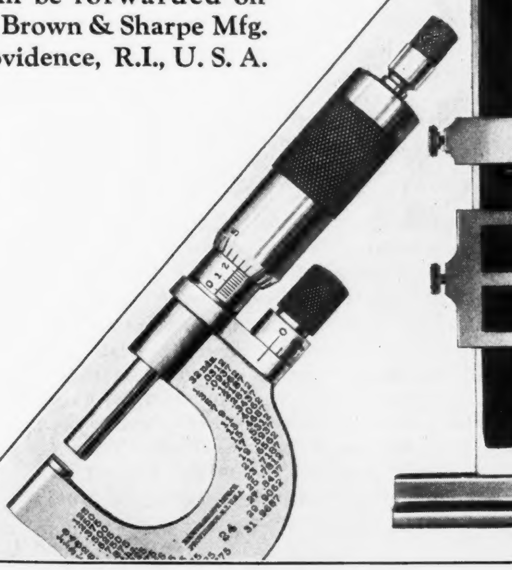
"World's Standard

Better Work—More Easily

increase their efficiency and cut down time for setting up and checking machine work.

To the workman, good tools are of direct and personal advantage. However skillful the machinist, he must have accurate aids to check his various steps in producing fine work. Tools which decrease the chance of costly error, materially increase his skill and his value.

Brown & Sharpe Tools insure rapid, accurate set-ups and are reliable for checking fine machine operations quickly. There is a Brown & Sharpe Tool for every mechanical requirement. Small Tool Catalog No. 31, listing over 2300 tools, will be forwarded on request. Brown & Sharpe Mfg. Co., Providence, R.I., U. S. A.

Sharpe Tools

of Accuracy"

George E. Merryweather

GEORGE E. MERRYWEATHER

George Edmund Merryweather, president of the Motch & Merryweather Machinery Co., Cleveland, Ohio, died Sunday evening, June 8, at his home in Gates Mills, Ohio. Mr. Merryweather was born in Cincinnati, Ohio, in 1872, and was educated at the Massachusetts Institute of Technology, graduating in 1896 with the degree of B.S. in mechanical engineering. Subsequently he was employed for five years by the Brown & Sharpe Mfg. Co., Providence, R. I., and had charge of the exhibit of that company at the Paris Exposition in 1900. He then became superintendent of the Overman Mfg. Co., at Chicopee Falls, Mass., which built steam-driven automobiles; and when that company was merged with the Locomobile Co. of America, he became superintendent of the shops of the latter company. He was the holder of many patents pertaining to machine tool equipment.

In 1904, Mr. Merryweather, together with Edwin R. Motch and Stanley Motch, organized the Motch & Merryweather Machinery Co., with its principal office in Cleveland, and branch offices in Cincinnati, Detroit, and Pittsburgh. During the World War, Mr. Merryweather was chief of the machine tool section of the War Industries Board. He was a director of the Central United National Bank, and a member of the American Society of Mechanical Engineers, the Society of Automotive Engineers, the Engineering Society of Cleveland, the Cleveland Chamber of Commerce, and the Technology Club of Northern Ohio, as well as of many other clubs and societies.

Mr. Merryweather is survived by his widow and five children.

SIDNEY A. KELLER

Sidney A. Keller, treasurer and one of the founders of the Keller Mechanical Engineering Corporation, Brooklyn, N.Y., died at his home in Woodmere, Long Island, June 4. Mr. Keller was born in Darmstadt, Germany, in 1872, the son of American citizens. His father died when he was but one year old, after which the family returned to the United States. They went back to Germany, however, at the time that Mr. Keller started to go to school, and he received his early education in that country.

At the age of fifteen he entered the jewelry business which his father had founded in New York, and while he was engaged in this business, he recognized the value of a mechanical method for producing dies for ornamental jewelry and silverware. In 1896, in partnership with his cousin, Joseph F. Keller, he formed the Keller Mechanical Engraving Co. During the early years the chief business of the company was the making of dies for the jewelry and silverware trade. As time went on machines were developed for the production of drop-forging dies, sheet-metal forming dies, and similar purposes, and gradually the chief business of the company became the manufacture and selling of machines for the production of dies.

Sidney A. Keller

In 1904, the partnership was incorporated, and in 1922, the name was changed to the Keller Mechanical Engineering Corporation. Until 1922, Mr. Keller had been president of the company, and from that time until his death he was treasurer, Joseph F. Keller being president.

Mr. Keller married Miss Elsie Davidson of New York in 1904. He is survived by her, as well as by his mother, a sister, and four sons.

NEWS OF THE INDUSTRY

PREST-O-LITE CO., INC., 30 E. 42nd St., New York City, announces the opening of a new plant for the manufacture of dissolved acetylene at 1240 Stewart Ave., S. W., Atlanta, Ga.

STEPHENS-ADAMSON MFG. CO., Aurora, Ill., manufacturer of conveying and elevating machinery, has removed its New York sales and engineering office to 50 Church St., Room 1360.

BLANCHARD MACHINE CO., 64 State St., Cambridge, Mass., manufacturer of grinding machines, grinding wheels, and reaming machines, announces that its shop and office will be closed for a period of two weeks from July 26 until August 11, for the annual vacation.

INDEPENDENT PNEUMATIC TOOL CO., 606 W. Jackson Blvd., Chicago, Ill., manufacturer of Thor electric and pneumatic tools and air compressors, has purchased the COCHISE ROCK DRILL MFG. CO., of Los Angeles, Calif., manufacturer of rock drills and mining tools.

DARDELET THREADLOCK CORPORATION, 120 Broadway, New York City, has granted a manufacturing and selling license under its patents for self-locking screw threads to the Bristol Co., Waterbury, Conn., manufacturer of safety hollow set-screws and socket-head cap-screws.

TITAN ELECTRIC CO., Adrian, Mich., has been recently reorganized, recapitalized, and incorporated. The company is now located in a new plant at Adrian and is engaged in manufacturing a line of fractional horsepower electric motors, generators, grinders and buffers, and pump jacks.

PRATT & WHITNEY CO., Hartford, Conn., has purchased all the patents and manufacturing rights for the Garrison gear grinder, manufactured by the Garrison Gear Grinder Co. of Dayton, Ohio. In the future, this machine will be known as the Pratt & Whitney 9-inch hydraulic gear grinder.

LANGELIER MFG. CO., Providence, R. I., has purchased the entire capital stock of Adams Bros., Inc., of Providence, manufacturer of foot presses, screw presses, transfer presses, and similar jewelry manufacturing equipment. It is the intention of the Langelier Mfg. Co. to continue the line. The company is negotiating for the purchase of several manufacturing plants.

LINCOLN ELECTRIC CO., Coit Road and Kirby Ave., Cleveland, Ohio, manufacturer of "Stable-Arc" welders and "Linc-Weld" motors, announces the removal of the company's Baltimore, Md., distributor's office from 432 N. Calvert St. to 600 N. Calvert St. This move has been made to provide additional space.

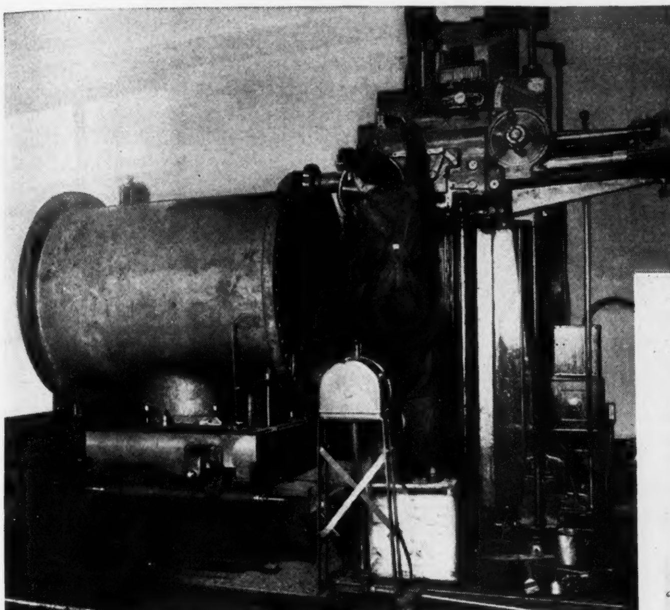
N. A. STRAND & CO., 5001 N. Lincoln St., Chicago, Ill., manufacturer of flexible shafts, have appointed Frecker Bros., Inc., 30 Church St., New York City, direct representative of the company for eastern New York state and northern New Jersey, succeeding W. B. DaSilva, who has served in that capacity for the last ten years.

ROBBINS & MYERS SALES, INC., Springfield, Ohio, announces that, owing to the expansion in its business, the fan and motor division of the company and the hoist and crane division of Robbins & Myers, Inc., have been moved from

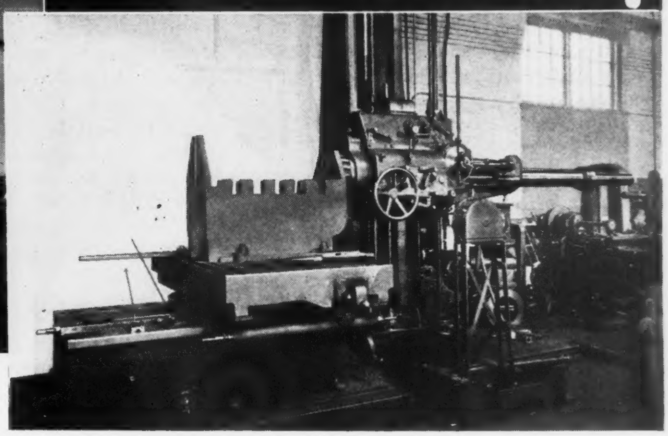
OHIO

HORIZONTAL BORING, DRILLING & MILLING MACHINES

TIME SAVED on Both these Jobs!



Ohio Floor Type Horizontal Boring, Drilling & Milling Machine Equipped With Compound Table



Time saved on both these jobs

Through simplification of set-up and combining of operations, this floor type Ohio Horizontal greatly reduced time on the jobs shown above. A 40% reduction in time was shown on facing and cutting the slots of the grinder pocket shown at the left. The 19,000 pound turbine condenser tee, shown at the right, was drilled and faced with equal facility.

This machine, a floor type Ohio Horizontal, in the Green Bay Barker Machine & Tool Company plant at Green Bay, Wis., handles castings of all sizes, saving time and giving extreme accuracy. Other Ohio Machines are showing equally good records in other plants. Let us send you data on their production.

The exclusive features of the Ohio Horizontals which assure permanent accuracy and good production time on the finest work are described fully in Bulletin 4071. Write for a copy.

Ohio Horizontal Boring, Drilling and Milling Machines are built in all standard types and sizes:—the table type—planer table type—floor type—and combination floor and table type machines; meeting all requirements for high grade machine tools of this kind.

THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO

General Distributors

JOSEPH T. RYERSON & SON, INC.

Chicago, Jersey City, Boston, Buffalo, Philadelphia, Cleveland, Detroit, Cincinnati, Milwaukee, Minneapolis, St. Louis, Tulsa, Kansas City, Denver. *Representation in:* New York, Pittsburgh, Grand Rapids, Houston, Los Angeles, Syracuse, Richmond, Duluth, Dallas, San Francisco.

567 E. Illinois St., Chicago, Ill., to larger quarters at 1133 Palmolive Building, 919 N. Michigan Ave., Chicago.

BLANCHARD LUBRICATION DIVISION OF RIVETT LATHE & GRINDER CORPORATION, Brighton District, Boston, Mass., announces that W. W. Chace, 181 Eddy St., Providence, R. I., will have charge of the distribution of the Blanchard pulsating lubrication system and other lubricating equipment made by this company throughout Rhode Island and Connecticut.

BROWN INSTRUMENT CO., Philadelphia, Pa., manufacturer of pyrometers, flow meters, and other indicating and controlling instruments, has just let a contract for an addition to its plant which will increase the floor space 40,000 square feet. The extra space will be in the form of two additional floors on all the new two-story concrete sections of the plant.

LUKENWELD, INC. has been organized as a subsidiary of the LUKENS STEEL CO., Coatesville, Pa., for the purpose of supplying welded steel construction to manufacturers of machinery and equipment. The company is prepared to furnish engineering assistance to users of this class of construction through a development and research division. G. D. Spackman is president of the new company.

TUBE-TURNS, INC., Louisville, Ky., has appointed the following new distributors for the line of seamless drawn fittings for welded pipe made by this concern: Grinnell Co., Charlotte, N. C.; Ebbert & Kirkman Co., Inc., Birmingham, Ala.; B. Hoffmann Mfg. Co., Milwaukee, Wis.; United Pipe & Supply Co., Charleston, W. Va.; Vulcan Copper & Supply Co., Cincinnati, Ohio; and Hedley & Voisinet, Buffalo, N. Y.

FOOTE BROS. GEAR & MACHINE CO., 111 N. Canal St., Chicago, Ill., at a recent meeting of the board of directors elected the following officers: First vice-president and assistant secretary, C. C. Commons; vice-president in charge of gear and reducer sales and advertising, F. A. Emmons; vice-president in charge of road machinery division, H. H. Bates; vice-president in charge of manufacturing, W. A. Barr; assistant vice-presidents, W. J. Heineman and W. O. Bates, Jr.

LINK-BELT CO., Crane and Shovel Division, 300 W. Pershing Road, Chicago, Ill., has recently appointed the following companies direct sales representatives: W-D-M Equipment Co., Box 329, Columbia, S. C.; Myer & Cunningham, 30 Church St., New York City; Barzee Equipment Co., 1223 Burnet Ave., Syracuse, N. Y.; S. G. Hawkins Co., 723 Washington Ave., Houston, Texas; Lewis-Patten Co., San Antonio, Texas; Hardware & Supply Co., Huntington, W. Va.

SIMONDS SAW & STEEL CO., Fitchburg, Mass., announces the Ninth Annual Economic Contest established by Alvan T. Simonds, president of the company. The subject for the 1930 contest is "Government Interference with the Free Play of Economic Forces." The contest is open to everybody. The first prize is $1000; the second prize, $500. The contest closes December 31, 1930. Further information may be obtained by addressing the Economic Contest Editor, Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

GODDARD & GODDARD CO., Detroit, Mich., milling cutter engineers and manufacturers, recently moved into their new factory and office building on the company's eight-acre site overlooking Rouge Park. The office portion of the building is two stories in height, built of brick and ornamental stone, and of unusually pleasing architectural design. The factory part of the plant is a one-story brick, steel, and glass construction building, with four monitors providing exceptionally well diffused daylight. The floor area totals 47,000 square feet.

MARQUETTE TOOL & MFG. CO., 6504 W. 65th St., Chicago, Ill., has recently erected a new plant to meet the increasing demand for the pneumatic die cushions made by this concern and to provide manufacturing facilities for its new products. The plant is of steel and concrete construction, covering an area of 30,000 square feet. Including the material yard, the total area covered is 75,000 square feet. The shop is equipped with three overhead cranes of 30, 7 1/2, and 5 tons capacity, respectively, running the whole length of the building.

MASTER ELECTRIC CO., Dayton, Ohio, announces that it has discontinued the manufacture of its entire split-phase motor line. This action has been taken in order to support the recommendation of the joint committee on fractional horsepower motors of Central Stations, which limits the starting current of all single-phase motors operating on lighting circuits to 15 amperes and eliminates the use of the ordinary split-phase type. In the future, the activities of the company will be concentrated on the manufacture of single-phase motors of the repulsion-induction type.

HARLEY-DAVIDSON MOTOR CO., Milwaukee, Wis., who for many years has made use of a specially designed roller bearing for the main bearings, connecting-rod bearings, and the gear-shaft bearings of the motorcycle engines built by the company and who has developed special machinery for the manufacture of these bearings, announces that the company is now supplying its roller cages and complete bearings to a number of manufacturers of small internal combustion engines, including aeronautical engines, and that the company is prepared to furnish bearings to others who may have special requirements of a similar kind.

WAGNER ELECTRIC CORPORATION, 6400 Plymouth Ave., St. Louis, Mo., announces the addition of Herbert Hoover to its Philadelphia branch sales office. Mr. Hoover received his electrical engineering training at the University of Oklahoma, finishing his course just in time to join the United States Army when the country entered the war in 1917. After the war, he entered the employ of the Empire District Electric Co. of Joplin, Mo. In October, 1920, he rejoined the United States Army as a member of the Dawes Commission. In 1923 he became general distribution engineer for the Potomac Electric Power Co., where he remained until he was made representative of the Wagner Electric Corporation in North Carolina and Virginia.

COMING EVENTS

AUGUST 24-29—Third International Congress of Applied Mechanics to be held at the Royal Technical Institute, Stockholm, Sweden. Further information may be obtained by addressing the American Society of Mechanical Engineers, 29 W. 39th St., New York City.

SEPTEMBER 22-26—Annual convention of the American Society for Steel Treating at the Stevens Hotel, Chicago, Ill. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

SEPTEMBER 22-26—Twelfth Annual National Metal Exposition under the auspices of the American Society for Steel Treating at the Stevens Hotel, Chicago, Ill. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, O.

SEPTEMBER 22-26—National Metal Congress at the Stevens Hotel, Chicago, Ill., in conjunction with the annual convention of the American Society for Steel Treating and the annual fall meetings of the Metals Division and the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers; the Iron and Steel Division and the Machine Shop Practice Division of the American Society of Mechanical Engineers; and the American Welding Society.

SEPTEMBER 29-OCTOBER 1—Semi-annual meeting of the American Gear Manufacturers' Association at Niagara Falls, Canada; headquarters, Hotel Clifton. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

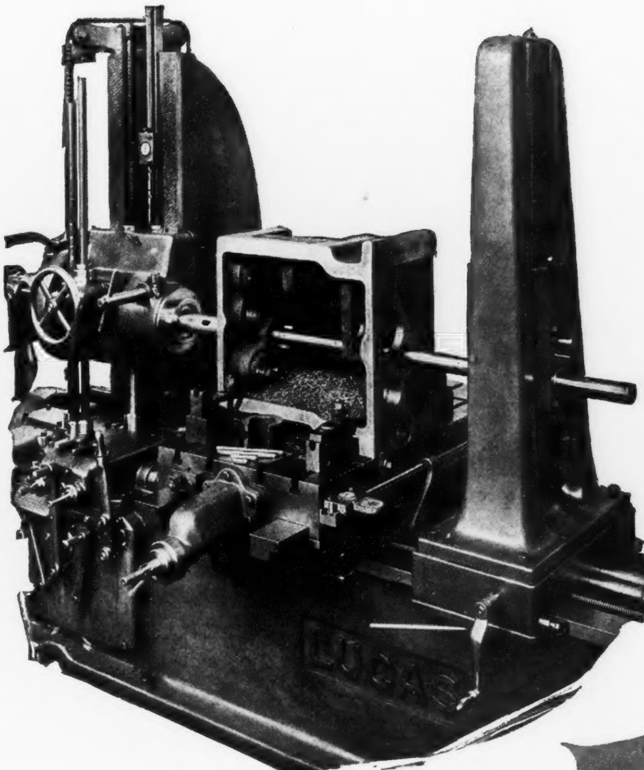
OCTOBER 7-8—Production Meeting of the Society of Automotive Engineers at the Book-Cadillac Hotel, Detroit, Mich. R. S. Burnett, director, production activities, Society of Automotive Engineers, 29 West 39th St., New York.

OCTOBER 15—Annual meeting of the Gray Iron Institute in Cleveland, Ohio. Manager, A. J. Tuscany, Gray Iron Institute, Cleveland, Ohio.

DECEMBER 1-6—Ninth National Exposition of Power and Mechanical Engineering in the Grand Central Palace, New York City.

DECEMBER 1-6—Fifty-first annual meeting of the American Society of Mechanical Engineers in the Engineering Societies Building, New York City. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

FEBRUARY 16-20, 1931—Second National Western Metal Congress and Exposition to be held in the Civic Auditorium, San Francisco, Calif., under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.



NEW BOOKS AND PUBLICATIONS

APPLIED MECHANICS. By Frederic N. Weaver. 322 pages, 6 by 8 1/2 inches. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, $3.25.

This work is based upon the author's teaching and engineering experience, and aims to present the fundamental principles of mechanics, as well as their application to practical problems. The material is divided into thirteen chapters dealing with the following subjects: Fundamental concepts; concurrent coplanar forces; parallel coplanar forces; coplanar forces in general; forces in space; machines; friction; rectilinear motion; kinematics of curvilinear motion and rotation; kinetics of plane motion; periodic motion; work and energy; momentum, impulse, and impact. The three appendices treat of the loaded cable or suspension bridge; center of gravity; and moment of inertia.

NEW CATALOGUES AND CIRCULARS

CABLE CONNECTORS. Crouse-Hinds Co., Syracuse, N. Y. Bulletin 2215, illustrating and describing "Arktite" extension cable connectors.

V-BELT DRIVES. Pyott Foundry Co., 328 N. Sangamon St., Chicago, Ill. Series of six folders outlining the advantages of the V-belt drive.

WELDING EQUIPMENT. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet 20390-B, descriptive of 200-ampere gas-engine-driven "Flex-Arc" welding sets.

NIBBLING MACHINES. Andrew C. Campbell, Inc., Waterbury, Conn. Catalogue describing the complete line of Campbell nibbling machines and their method of operation.

SCREW PRODUCTS. Standard Pressed Steel Co., Jenkintown, Pa. Catalogue illustrating and describing "Unbrako" hollow set-screws, as well as other "Unbrako" screw products.

VENTILATING AND HEATING EQUIPMENT. Buffalo Forge Co., 144 Mortimer St., Buffalo, N. Y. Circular containing data on the new Buffalo 16-inch twin Breezo-fin unit heater.

STEEL CASTINGS. Lebanon Steel Foundry, Lebanon, Pa. Circular entitled "Green Lights of Safety with Lebanon Steel Castings," illustrating the application of these castings in the railway field.

TURRET LATHE EQUIPMENT. Gisholt Machine Co., Madison, Wis. Bulletin 32, illustrating a special type of collet chuck for increasing the bar capacity of Gisholt high-production turret lathes.

WIRE-WORKING MACHINES. Baird Machine Co., Bridgeport, Conn. Circular illustrating the Baird four-slide forming machine, and giving a typical list of products for which this machine is applicable.

ELECTRIC GENERATORS. Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio. Bulletin 500, descriptive of Reliance motor-generator sets for converting alternating current into direct current.

MATERIALS HANDLING EQUIPMENT. Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Bulletins illustrating and describing tramrails and tramrail carriers.

VARIABLE-SPEED TRANSMISSIONS. Reeves Pulley Co., Columbus, Ind. Circular illustrating and describing variable-speed transmissions made in sizes ranging from less than 1 horsepower up to 150 horsepower.

FUSE CLIP CLAMPS. Trico Fuse Mfg. Co., Milwaukee, Wis. Circular illustrating and describing the "Kliplok" clamp for fuse clips which is designed to insure proper contact and eliminate high resistance and excessive heat.

CONVEYOR CHAIN. Transue & Williams Steel Forging Corporation, Alliance, Ohio. Catalogue of industrial drop-forged conveyor chain, outlining the special features and listing the various sizes and the tensile strength of each.

MILLING CUTTERS AND REAMERS. Goddard & Goddard Co., Detroit, Mich. Bulletin 102, illustrating and describing inserted serrated blade cutters and expansion reamers. Dimensions and price lists of the various sizes are included.

ELECTRIC MOTORS. Fuerst-Friedman Co., 1292 E. 53rd St., Cleveland, Ohio. Electric Motor Bargain Bulletin for May, 1930, containing list prices of electric motors and generators, centrifugal compressors, automatic control equipment, arc welders, etc.

MILLING MACHINES. Kearney & Trecker Corporation, Milwaukee, Wis. Catalogue entitled "Milling Methods of the Automotive Industry," telling briefly of the widespread application of Milwaukee milling machines in the manufacture of automotive parts.

TOOL AND DIE SERVICE. City Machine & Tool Works, East Third and June Sts., Dayton Ohio. Circular entitled "Tool Work—from Ounces to Tons," outlining the tool and die service offered by this company, which covers engineering, designing, and manufacturing.

ELECTRIC MOTORS. Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo. Bulletin 171, on Fynn-Weichsel motors. Constructional details and applications of the motors are illustrated, and one section of the bulletin is devoted to control equipment.

TRUCKS. American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa. Catalogue describing this company's standard line of pressed-steel hand trucks. Seven new styles of trucks are shown that have been added to the line since the publication of the last catalogue.

PORTABLE ELECTRIC TOOLS. Chicago Pneumatic Tool Co., 6 E. 44th St., New York City. General catalogue 898, covering the complete line of CP "Little Giant" electric tools, which ranges from small drills weighing 6 3/4 pounds to heavy-duty reamers weighing 96 pounds.

PORTABLE DRILLS. Guibert Steel Co., P. O. Box 1037, Pittsburgh, Pa. Catalogue illustrating and describing the "Toggle Bug" portable drill, which is capable of drilling holes up to 1 1/2 inches in diameter. The machine can be lifted and carried by three men and operated by one.

BALL BEARINGS. New Departure Mfg. Co., Bristol, Conn. Sheet for loose-leaf catalogue, No. 193FE, illustrating the application of ball bearings in drilling and tapping heads. Sheets for Bulletin XXXVIII. "Loads Due to Gears," giving formulas for calculating loads due to hypoid gears.

ELECTRIC EQUIPMENT. Electric Controller & Mfg. Co., Cleveland, Ohio. Bulletin 920, descriptive of E C & M time-current magnetic controls for direct-current motors. Bulletin 1047-A, descriptive of E C & M 2300-volt automatic compensators for alternating-current squirrel cage and synchronous motors.

STEEL. Sivyer Steel Casting Co., Chicago, Ill. Sheets for loose-leaf catalogue descriptive of the Nukeel interlock reversible dipper tooth and the Nukeel clinch point reversible dipper tooth for power shovels, dredge dippers, skimmer scoops, etc. Sheet containing a list of representative physical properties of "Miraculoy," a Sivyer alloy steel.

DIAMOND TOOL BORING MACHINES. Automatic Machine Co., Bridgeport, Conn. Diamond tool boring engineering data bulletins Nos. 110 and 111, illustrating typical examples of work done on the Coulter single-spindle diamond tool boring machine, and fixtures employed. Complete engineering data for the different jobs illustrated is included.

TRANSMISSION EQUIPMENT. Boston Gear Works Sales Co., North Quincy, Mass. Catalogue 49, covering the complete line of Boston standardized gears and transmission equipment, which includes spur gears, helical gears, change-gears, non-metallic gears, worms and gears, chain drives, speed reducers, couplings, universal joints, ball bearings, etc.

MATERIAL - HANDLING EQUIPMENT. Chain Belt Co., Milwaukee, Wis. Catalogue 202, on bulk material handling conveyors. The book illustrates bucket elevators of all types, super-capacity elevators, bin gates, track hoppers and feeders, steel apron and pan conveyors, and screw conveyors. Engineering data relating to this line of equipment is included.

BEARING ADJUSTMENT. L. Holland-Letz Co., Crown Point, Ind. Circular illustrating and describing a simple adjustment for taper roller or ball bearings by means of which play can be taken up and bearing pressure adjusted. This "Tacup" adjustment is applicable to lathe or milling machine spindles, heavy-duty grinder spindles, internal grinder spindles, etc.

PORTABLE ELECTRIC TOOLS. United States Electrical Tool Co., 2477 W. 6th St., Cincinnati, Ohio. Catalogue covering the complete line of electric tools and machines made by this company. Many improved designs and patented features are shown in the new catalogue, among which may be mentioned a "Multi-speed" buffer having four different wheel speeds ranging from 2000 to 3000 revolutions per minute.

LATHES. South Bend Lathe Works, 775 E. Madison St., South Bend, Ind. Hand Book No. 33 for the Auto Mechanic. This book contains 32 pages, 6 by 9 inches, explaining how a back-geared screw-cutting precision lathe may be used to advantage on many servicing jobs in repair shops, service shops, garages, etc. In addition to the description of jobs for which these lathes are applicable, a number of the different sizes of lathes are illustrated and specifications are included.

DIE-BLOCKS. Heppenstall Co., Pittsburgh, Pa. Catalogue descriptive of the process of making Heppenstall drop-forging die-blocks. Following the description of the process of manufacture, the various grades of die-blocks are listed and characteristic applications are illustrated. Instructions for annealing, tempering, hardening, etc., are also included, as well as tabular matter, such as die-block weights, weights of flat rolled bar steel, conversion tables, drawing bath mixtures, etc.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. Bulletins GEB-80, GEC-81A, GEA-55B, 189B, 246B, 440C, 735B, 973A, 1062A, 1159A, 1195, 1238, 1239, 1246, and 1252, dealing, respectively, with metal-clad switchgear for indoor and outdoor service; industrial heating devices; round-pattern switchboard instruments; automatic switching equipment for indoor feeder service; general-purpose synchronous motors; turn-pull control switches; outdoor switching equipment; drum controllers for direct-current motors; line contacts for outdoor disconnecting switches, air circuit breakers; synchronous motors for driving metal-rolling mills; vitrious-enameled resistors; miniature instruments for panel mounting; car compass for aircraft; and hatchway limit switch for control circuits.